

The

JANUARY 1942

TOOL ENGINEER

MACHINERY

• PRODUCTION

• TOOLS

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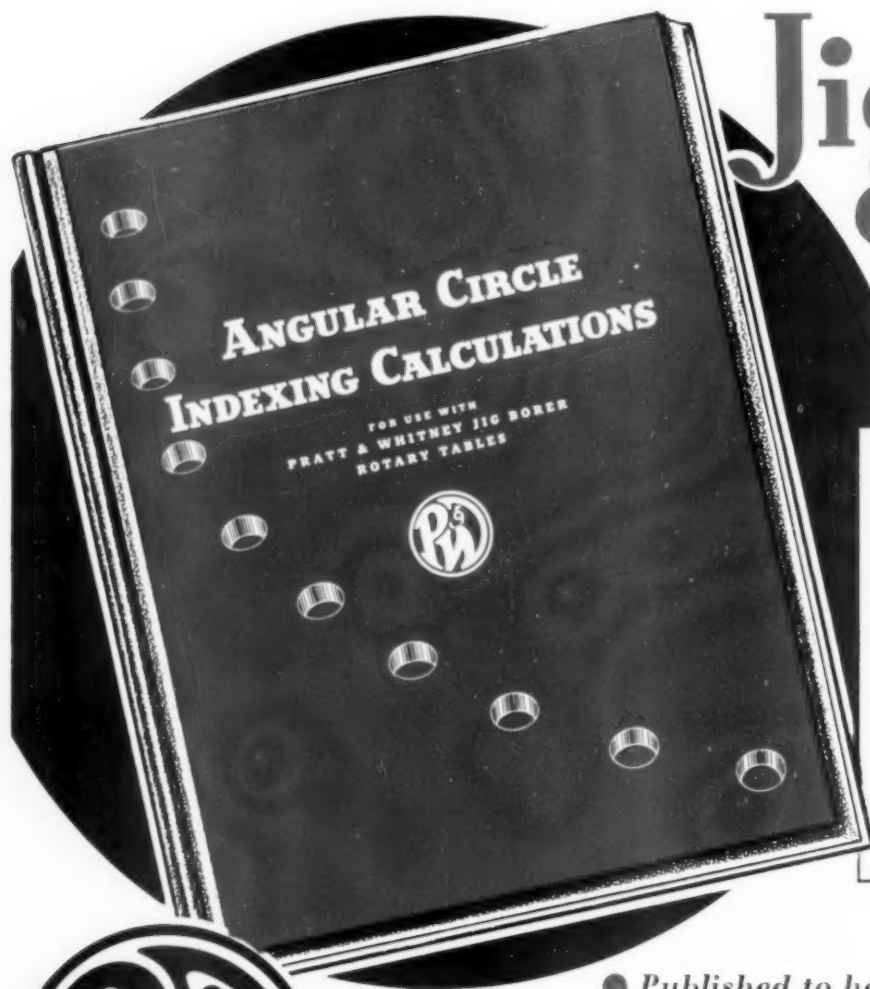
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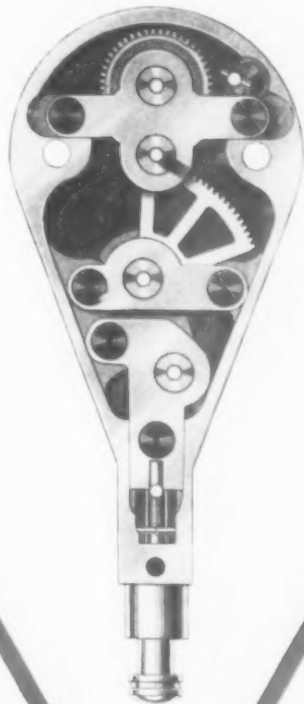
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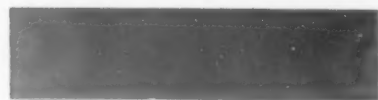
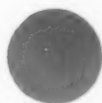
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LOUIS BIEHLER

Methods of producing parts which are peculiar to the aircraft industry are discussed by Louis Biehler, Assistant Superintendent of the Aircraft Division, Pullman Standard Car Company, in his article "Multiple Sheet Profiling and Forming by Rubber" which will be in the next issue.

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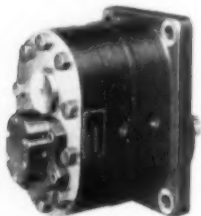
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*Gear (traverse) pump.



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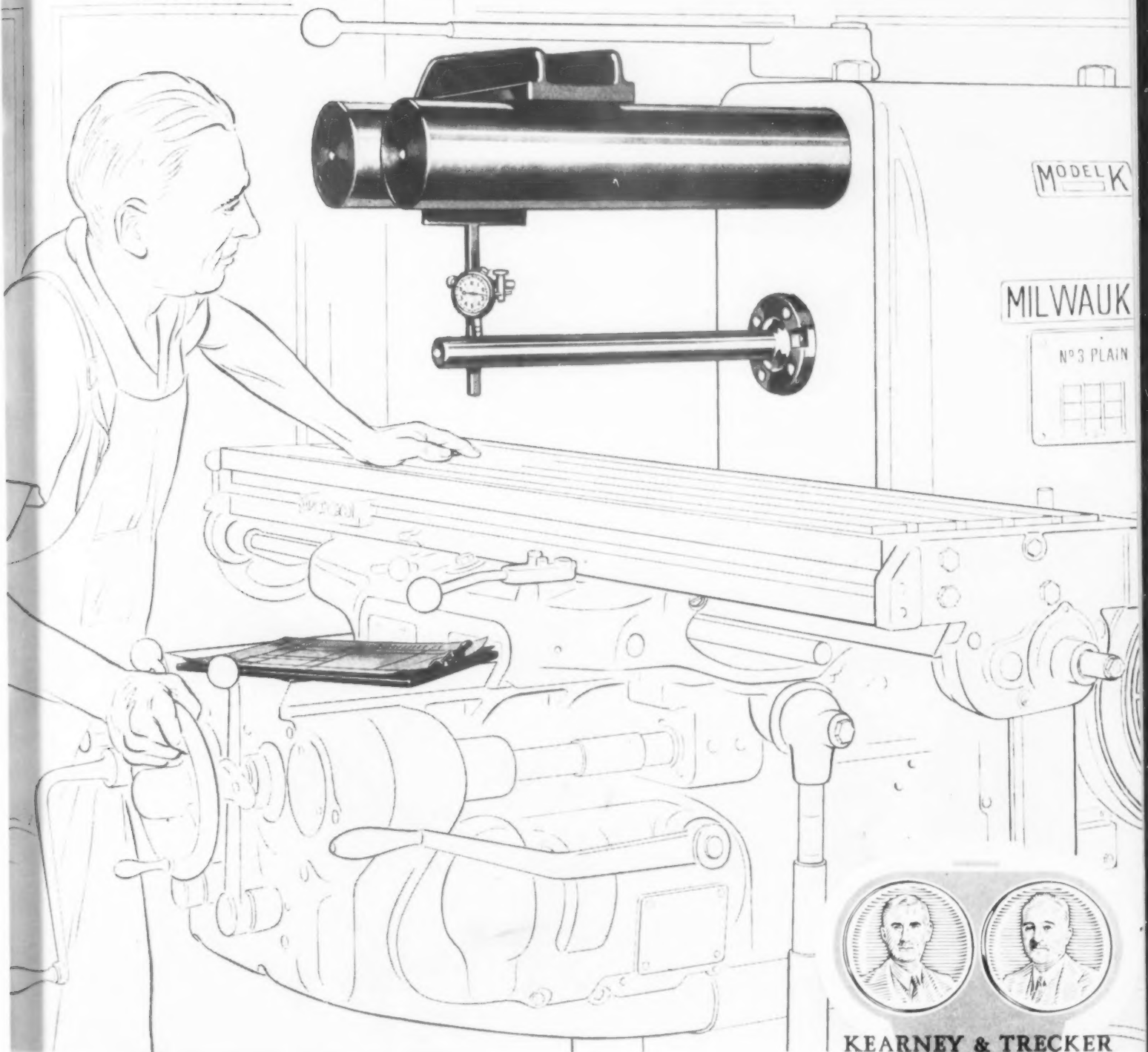
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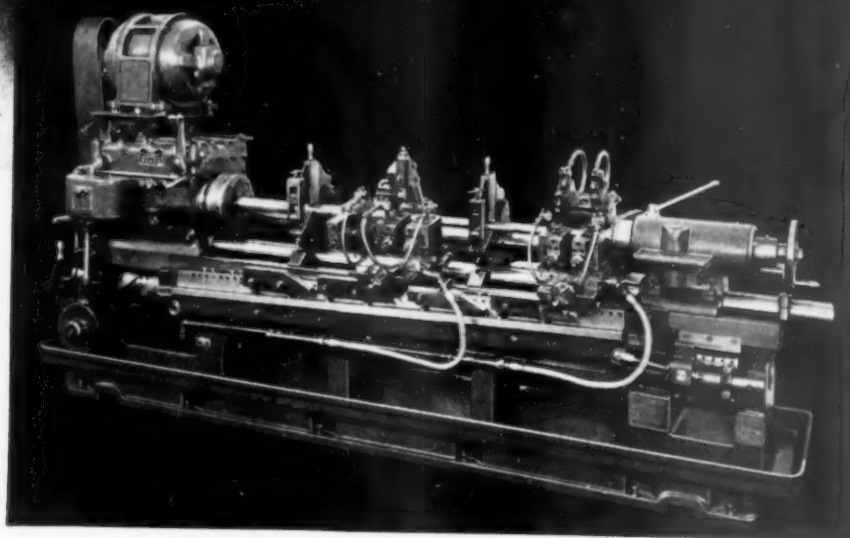
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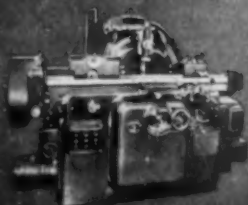


IN 1851 at the Crystal Palace, London, the Duke of Wellington, James Nasmyth and Joseph Whitworth saw six American rifles taken apart, saw the parts shuffled and six rifles quickly assembled from parts chosen at random. Thus was interchangeable manufacturing introduced to England from a Vermont shop, of which the Jones & Lamson Machine Company is a direct successor. Thus also did this Vermont machine tool shop win the contract for equipping Britain's Enfield Armory — an early and bright chapter in Anglo-American cooperation.



Jones & Lamson 12 x 81" Fay Automatic Lathe tooled to machine an aircraft cannon

AUTOMATIC THREAD GRINDERS



OPTICAL COMPARATORS



RAM TYPE UNIVERSAL TURRET LATHE



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when he saw it.

NINETY years have passed since James Nasmyth, famous British engineer, arranged for a Vermont machine tool shop to equip the Enfield Armory for interchangeable manufacturing.

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vanced, more precise, more rapid machine tool technique.

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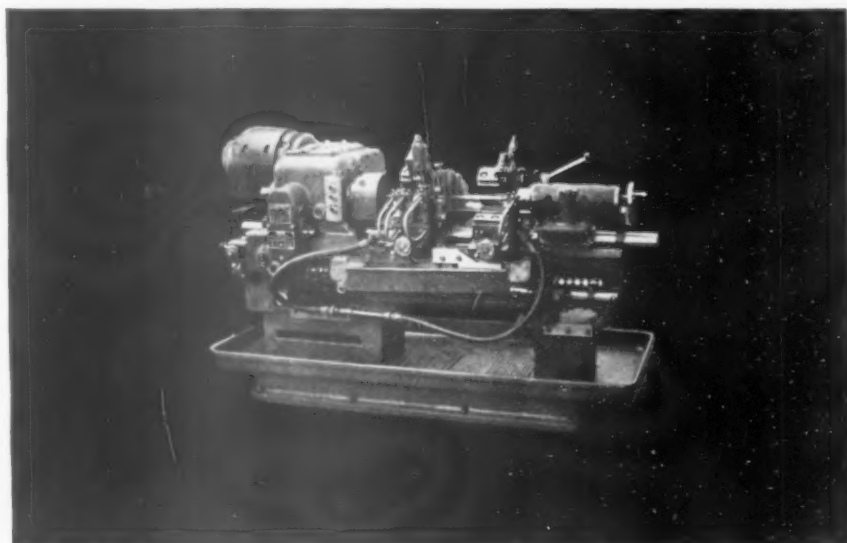
Herein lie many of the reasons why it pays to put your production problems up to Jones & Lamson engineers. Let Jones & Lamson help you. Inquiries from large plants or small receive careful, thorough study, and illustrated catalogs of Jones & Lamson equipment are available.

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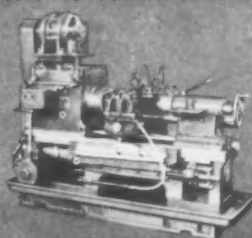


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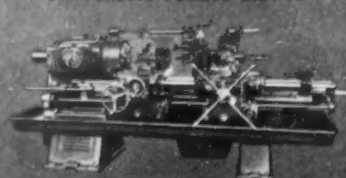
**Jones & Lamson 8 x 33" Fay Automatic Lathe
tooled to machine an automatic rifle barrel**

FAY AUTOMATIC LATHES



**AUTOMATIC OPENING
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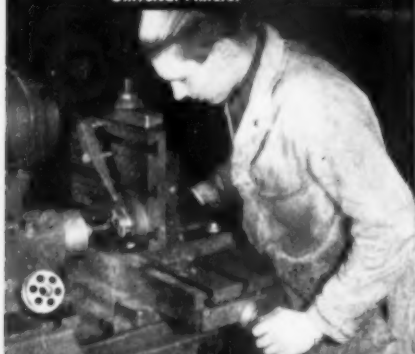
**SADDLE TYPE
UNIVERSAL TURRET LATHE**



Precision boring and facing airplane engine part, with relationship between shoulders and flange rigidly held—Junior Double End Machine . . . with Ex-Cell-O Universal Fixture.



Precision boring Diesel part for U. S. Navy, holding bore concentric with O. D. and six other holes—Junior Single End Machine . . . with Ex-Cell-O Universal Fixture.



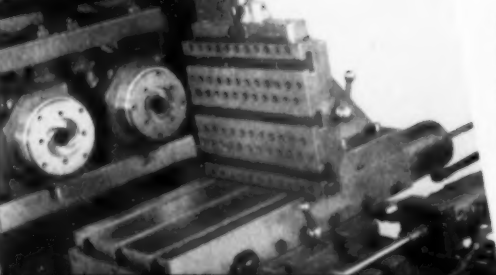
Precision boring aircraft part to limits of $\pm .0005"$ and lining distance between large and small holes to same exactness—on Junior Single End Machine . . . with Ex-Cell-O Universal Fixture.



Precision finish boring machine tool part, with $11\frac{1}{16}"$ hole kept parallel to base and dovetail—on Junior Double End Machine . . . with Ex-Cell-O Universal Fixture.



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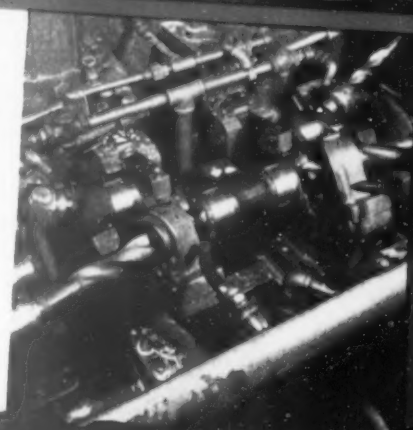


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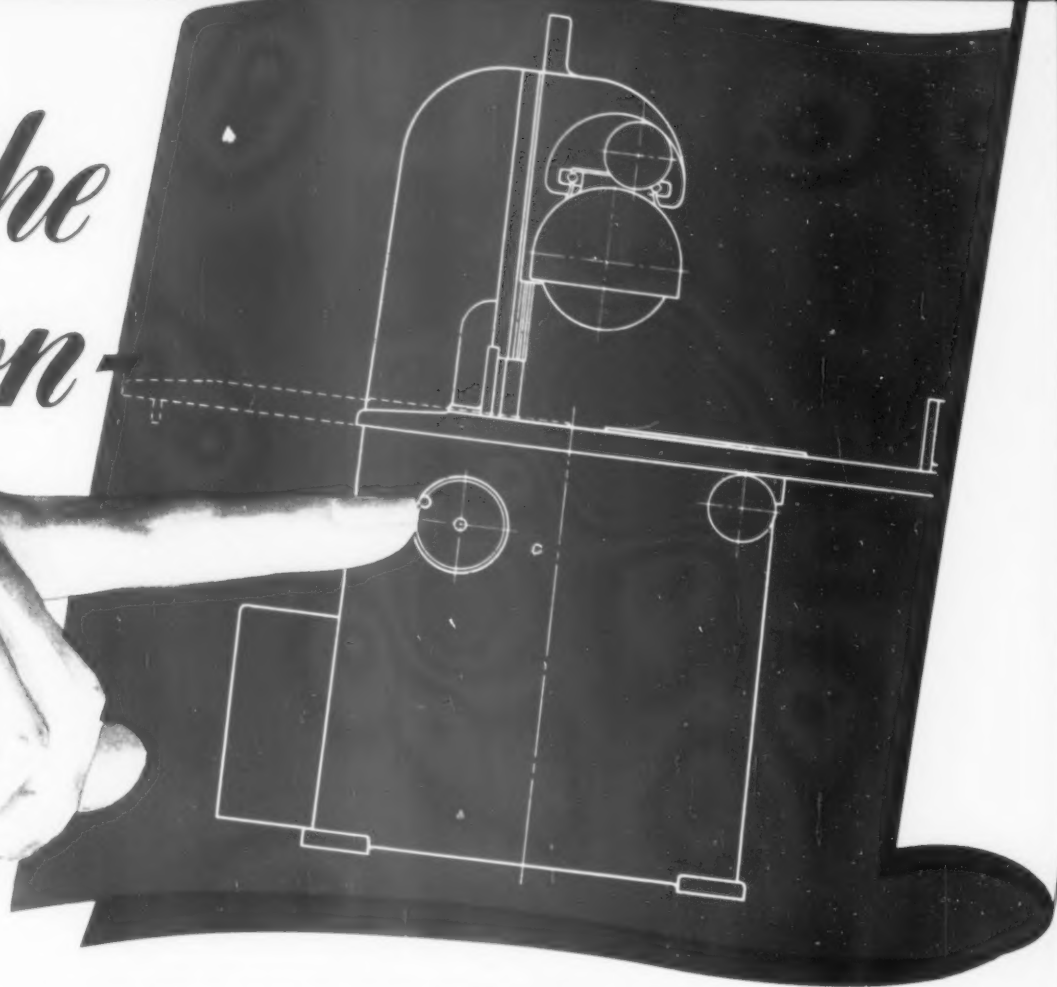
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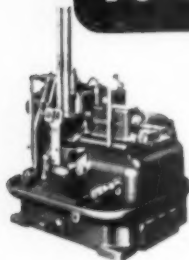
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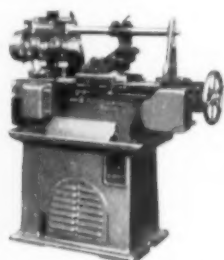
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What BARBER-COLMAN MEANS In '42 TO ACCURATE HIGH PRODUCTION



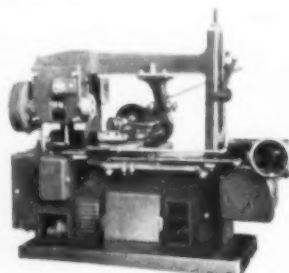
TYPE 3 Automatic Hobbing Machine — For production of small precision gears up to 1" diameter x 1/4" face and 200 D.P.



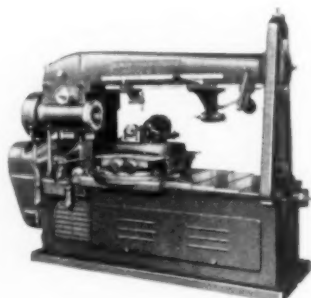
No. 3 Standard Hobbing Machine — Capacity: 5" dia. x 7" face, 12 Pitch and finer. Built also in Precision Type.



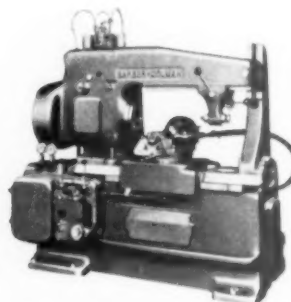
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TYPE A Hobbing Machine — A rigid, accurate machine for general purpose or production hobbing. Capacity: 12" dia. x 12" face. 4 Pitch and finer.



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HOBBS — Ground and Unground, Standard and Special.



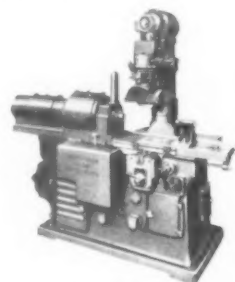
MILLING CUTTERS — "Paraform" Design; Formed, Standard and Special.



REAMERS — Fluted, Inserted Blade, and "Pinwedge" Expandable Reamers.



COMBINATION Sharpening Machine — Sharpens hobs, cutters and reamers; straight gashed up to 24" stroke; or maximum 30" helix with 8" stroke.



No. 3 and No. 4 Automatic Hob Sharpening Machines for hobs and formed cutters. Capacities: No. 3 — 4" dia. x 4" face, No. 4 — up to 10" dia. x 12" face.



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It can be done and it gives us a chance to repeat what we have said many times in the past: *That for all around production work there is no better blade than Barnes Molybdenum SERVICE.*

Made in hand and power sizes, the performance of these blades has won thousands of friends — and before this emergency is over, it will win many more.

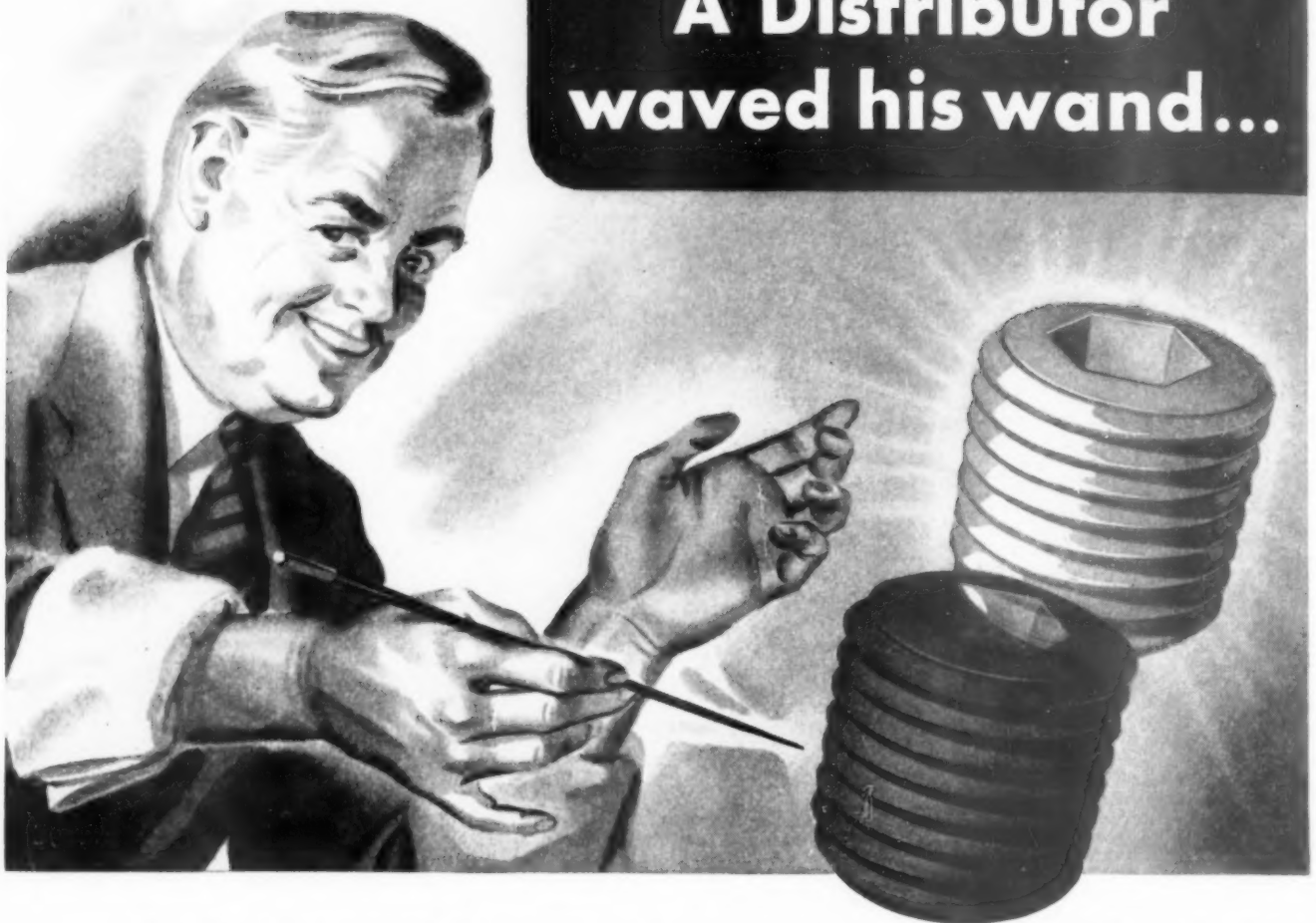
Remember its insignia of quality — the mark of a Barnes Better Blade.






Sold throughout the United States by industrial distributors whose service to industry we respect and value. Through them you can buy Barnes SERVICE Blades today. A trial will convince you of their outstanding quality.



A Distributor waved his wand...



..and vital Machine Tools went out on Schedule!

"But I can't use those threaded plugs!" protested the machine tool manufacturer. "They're black—look!  I've got to have 'em tinned—here, like this one, see?  And we can't ship presses with the oil  holes open!"

Well, of course there was a resourceful Distributor on the receiving end of this chat and he had a friend who knew about plating. And in a jiffy the plugs were completely treated and the presses were shipped on the dot. Sure enough—you may never need *plating counsel* from your

Distributor. But how fine to remember when you get into *any* jam, that he is just as near as your telephone and ready to pitch in with whatever the help you need most!

Perhaps the whole story of the Industrial Distributors' contribution to Defense Production will never be told. But *you* know and *we* know they deserve a lot of credit—so we are going right on with our years'-long policy of distributing Drills and Reamers to you through their capable hands.

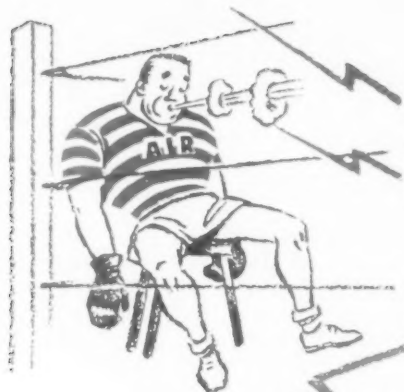
This incident is typical of the unusual services that many Mill Supply Distributors are rendering their customers during the Emergency.

We favor adequate Preparedness for National Defense

The CLEVELAND **TWIST DRILL COMPANY**
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES
 30 READE ST. NEW YORK 9 NORTH JEFFERSON ST. CHICAGO 650 HOWARD ST. SAN FRANCISCO
 6515 SECOND BLVD. DETROIT LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST. E.C.4



"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU



BOUT of the O'TOOLS

10 ROUNDS—AIR VS. HIGH-CYCLE
GRINDERS

HIGH-CYCLE WINS ROUND 1

SET-UP:

At Pressed & Welded Steel Products Co., Long Island City, N. Y., fabricator of miscellaneous stainless steel products. Needed four more portable tools—grinders and sanders. Short of air supply.

Should it be AIR or HIGH-CYCLE? The Rotor Analyst recommended HIGH-CYCLE. The results:



HIGH-CYCLE defeats AIR in this plant with these three telling blows!

- 1 Gives 25% **FASTER** production. On this job, higher speed under load with HIGH-CYCLE grinders and sanders accounts for 25% to 30% more work per hour than with AIR tools
- 2 Saves \$1695 in first cost. Air compressor and installation—63.5 B. H. P.—would have cost \$2632. Frequency converter (10 K.W.) for HIGH-CYCLE cost only \$937. Saving: \$1695 or 64%.
- 3 Cuts power bill \$725 per year. Saves 48.5 B.H.P. or 36.2 K.W. At 1c per K.W.H., that's \$725 per 250-day year on full load basis—enough to pay for the frequency converter in 16 months.

WHAT WOULD BE THE SCORE IN YOUR PLANT?

Are you *sure* you're getting peak production from your portable tools? Why not let the Rotor Analyst stage and referee the bout of AIR and HIGH-CYCLE

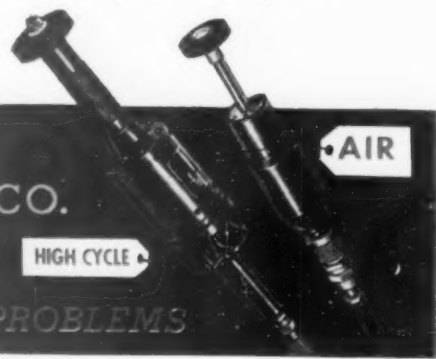
in your "ring"—to find out definitely which type of tool can turn out most work under your set-up and give you greatest savings. No obligation.

The Rotor Analyst has 65 different AIR tools and 59 different HIGH-CYCLE tools with which to solve your problems.

THE ROTOR TOOL CO.

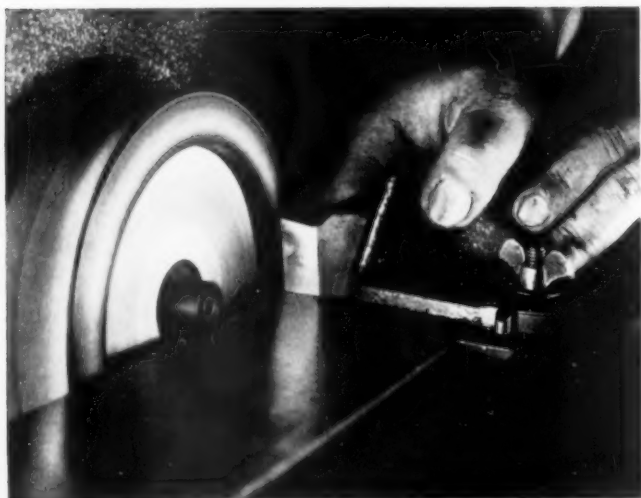
CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



HELP FOR NEW USERS OF CARBIDE TOOLS

**Diamond wheels by Carborundum
can do a better job of sharpening
and reconditioning at less cost...**



● A recently announced substantial reduction in the price of cemented carbides means that more manufacturers than ever are using cutting tools of this remarkable material. It means too, that many manufacturers for the first time will be confronted with the problem of how best to sharpen cemented carbide tools and keep them in condition.

The problem has already been solved by the development of the Carborundum Brand Diamond Wheel.

This wheel, made of crushed diamond bort, has been sensationally successful in reconditioning cemented carbide tipped tools. The Carborundum Brand Diamond Wheel gives cleaner, sharper cutting edges, with less danger of cracking or checking the tip, than was ever before thought possible. And it gives these results at greatly reduced cost!

The advantages of the Carborundum Brand Diamond Wheel are fourfold: (1) It gives a sharp, clean, cutting edge without the added expense of lapping. (2) Tools last longer because the wheel is cool- and free-cutting; less stock is removed per grind to obtain a satisfactory cutting edge and tools need conditioning less often. (3) Saves time in grinding because a sharp, smooth edge is obtained directly from the wheel and rate of stock removal is amazingly high. (4) Reduces maintenance cost of grinding machines because the wheel cuts so easily with light grinding pressure.



Whether you are a new or old user of cemented carbide tools, why not enjoy all these benefits of the Carborundum Brand Diamond Wheel? Ask our representative for complete details.

CARBORUNDUM
CREATIVE PRODUCTS

THE CARBORUNDUM COMPANY

REG. U. S. PAT. OFF.

Niagara Falls, N. Y.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)



"MAKE THEM IN TANDEM"

If you use tubing in place of bar stock in the fabrication of cylindrical parts it is often possible to make multiple parts in tandem.

There's less cycle time per part, faster speeds and less down time, too.

LOOK AHEAD!
Save time and
materials now to
make money
tomorrow.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

ALLOY STEELS



AT WRIGHT AERONAUTICAL

Back of the plane and tank and gun—back of our entire defense program—stands the man behind the machine. In Wright Aeronautical Corporation toolroom at Paterson, N. J., this craftsman at a South Bend Lathe is doing his part in defending America.

The Man Behind – the Man Behind the Gun!



IN DEFENDING AMERICA, the man behind the machine is just as important as the man behind the gun. Back of the production lines of every defense industry is our *first line of defense*—the toolroom. Here, where precision is of utmost importance—where tolerances are reckoned in split-thousandths—you will find South Bend Lathes.

Modern in design, built with extreme precision, South Bend Lathes are fast and

accurate on the most exacting classes of toolroom work. Their wide range of spindle speeds permits machining with maximum cutting tool efficiency. Their versatility facilitates quick change-over through a minimum of set-up time.

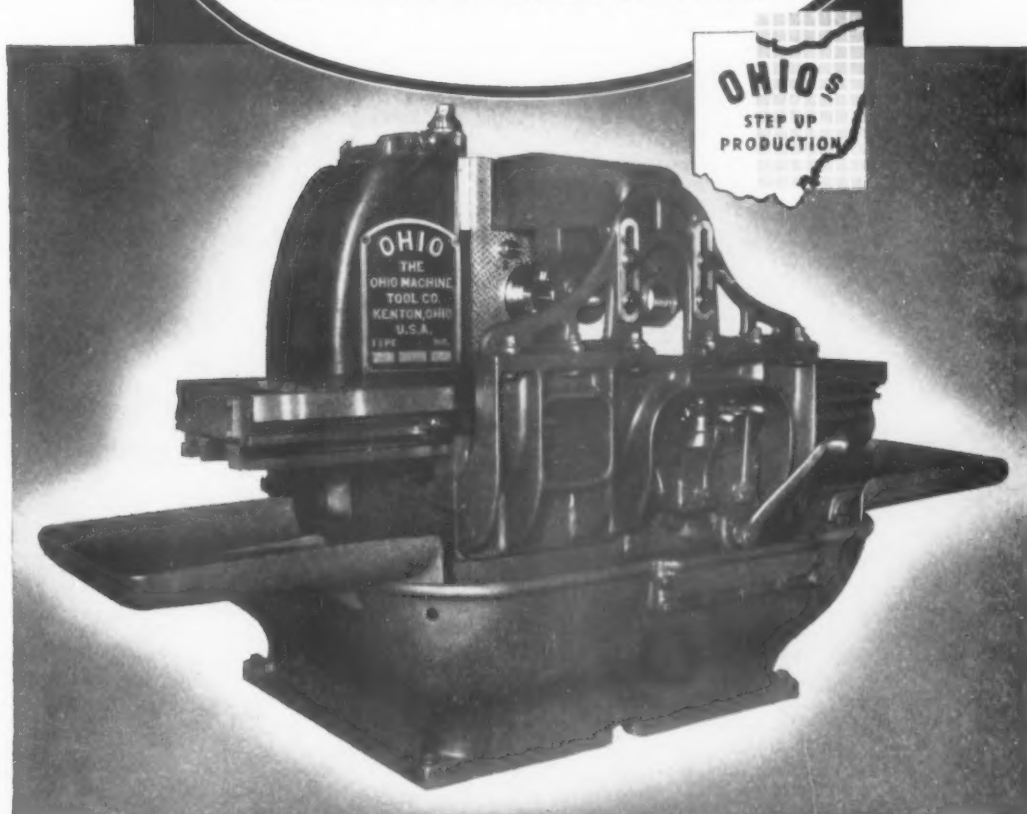
South Bend Lathes are made in five sizes: 9", 10", 13", 14½", and 16" swing, with toolroom or manufacturing equipment. Write for catalog and the name of the dealer nearest you.

SOUTH BEND LATHE WORKS

476 EAST MADISON STREET, SOUTH BEND, INDIANA, U. S. A.



OHIO PRODUCTION MILLING MACHINES



Convenience and accessibility make the Ohio Production Milling Machine rapid in production, yet easy to set up for short runs. Powerful, true cutter rotation, rigidity, a true plane of travel and positive locked feed enable it to mill equally well *with and against the feed*, making possible continuous milling operations without indexing features. Climb-cutting lengthens cutter life. Various cycles of automatic operation of the feed and rapid traverse are available.

THE OHIO MACHINE TOOL COMPANY, KENTON, OHIO

Orders for Ohio Production Milling Machines are being shipped promptly.

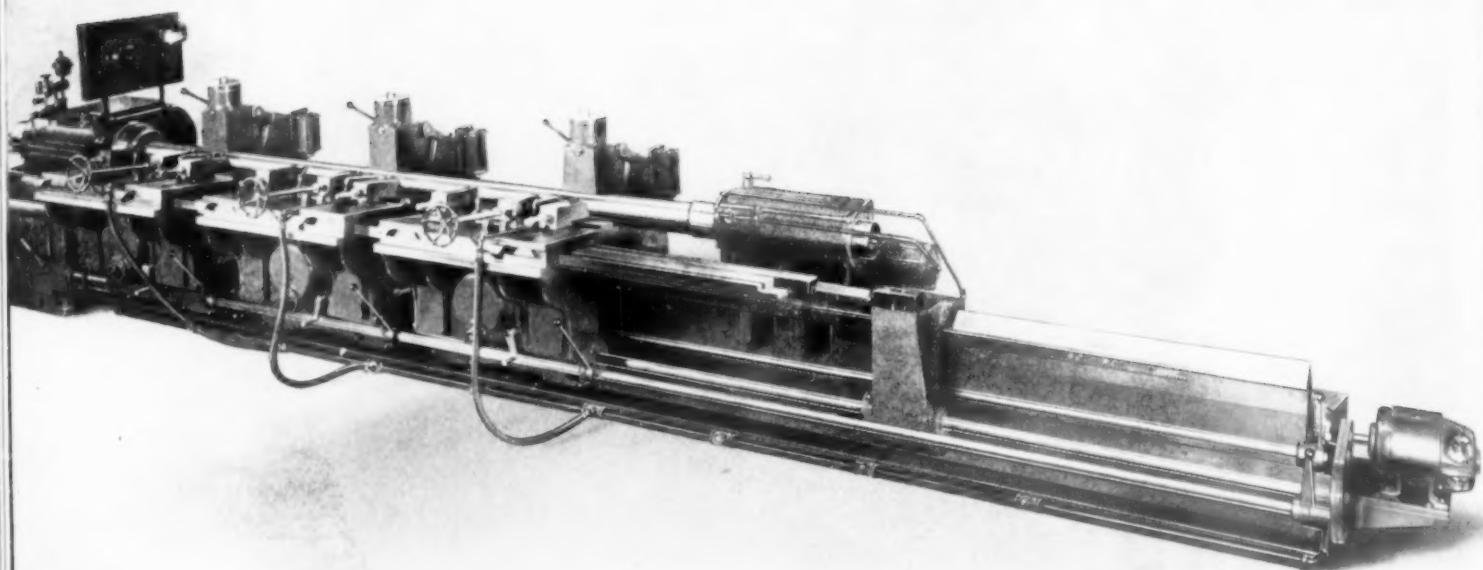
OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

NEW MODEL LS Lo-swing TURNS LARGE GUN BARRELS



Problem: To increase production on turning operations of gun barrels up to 14" diameter by 21' long.

Solution: This job was being done on a conventional Gun Lathe. There being a limit to the speeds and feeds which the tools would stand, the only way to further increase production was to use multiple tooling. Using multiple tools meant that the barrel must be rigidly supported by steady rests while being turned. The Lo-swing method with carriages on the front which will pass the tailstock and the steady rests which, in turn, rigidly support the work seemed to be the best answer. As no Lo-swing large enough for this work had been built, the large Model "LS" Lo-swing was designed for the job. Nine tools were mounted on three carriages to turn the straight diameter tapers and contours simultaneously

while three roll steady rests support the work. By this method the length of the longest cut was reduced to 32" and the production on the turning operation was stepped up to one per hour.

To facilitate setup, the carriages can be rapid traversed either forward or backward independently or together. To make for easy chip disposal, the rear of the bed slopes down at a 20° angle.

While a constant speed AC motor could be used for the main drive, a DC variable speed motor was used so that the most efficient cutting speed could be exactly and instantaneously obtained. The complete length of the barrels was turned in one operation, the work being driven from a slot in the muzzle end and expanding centers locating in the bore were used to maintain concentricity.

WHERE YOU CAN'T USE CEMENTED
CARBIDES GET A



Big Plus

IN PRODUCTION WITH

TANTUNG "G"

PATENTED

• Where you can't use cemented carbides, this is the easiest way to get a big plus in production. Figure out for yourself what it would mean if you could increase your cutting speeds 50%—And some have doubled their speeds just by substituting Tantung "G" tools. The same tools work equally well on steel, cast iron and non-ferrous metals.

It's so easy too, to make the switch to Tantung "G". Tools are available as standard in a wide variety of sizes in solid tool bits, all purpose tools, cutting off tools, and as blades for inserted tooth milling cutters. Special tools can be made for the unusual setup.

You owe it to yourself to get full particulars at once.

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS

DISTRICT OFFICES

BIRMINGHAM: 3-2905 • BUFFALO: Washington 7716 • CHICAGO AREA: Rogers Park 9500

CINCINNATI: Main 5387 • CLEVELAND: Cherry 0278 • DETROIT AREA: Madison 6300

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NEW YORK AREA: Worth 2-3923 • PHILADELPHIA: Trinity 8782 • PITTSBURGH: Atlantic 9699

PROVIDENCE: Dexter 1271 • ST. LOUIS: Newstead 3110 • SYRACUSE: 3-0334

IN CANADA: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

421

THE TOOLS THAT GET THINGS DONE

Standardize on this Analysis DBL High Speed Steel

Here's Why!

1. DBL meets the tungsten supply situation and OPM orders; it is a tungsten-moly steel containing less than 1.3 as much tungsten as 18-4-1.
2. It matches or out-performs 18-4-1 in nine out of ten cases.
3. It heat-treats virtually the same as 18-4-1, requiring only a slightly lower hardening temperature.
4. In hardening DBL, no coating is required.
5. It does not de-carburize; gives no "soft-skin" troubles.
6. Tools are made from it to the same machining and grinding tolerances used for 18-4-1.
7. DBL costs 16% less than 18-4-1.
8. It weighs 8% less, giving you more tools per pound.
9. Free patent license is offered, without time limit or other strings.
10. Under such licenses, DBL is produced by leading tool steel manufacturers. It can be identified as follows:

Analysis

C	.75	—	.85
Cr	3.50	—	4.50
W	5.00	—	6.00
Mo	4.00	—	5.00
V	1.25	—	1.75

ALLEGHENY LUDLUM

STEEL CORPORATION

PITTSBURGH, PA.

Tool Steel Division



Waterwliet, N.Y.

Allegheny Ludlum Steel Corporation
Oliver Building, Pittsburgh, Penna.

Send me a copy of the "DBL Blue Data Sheet."

NAME _____

COMPANY _____

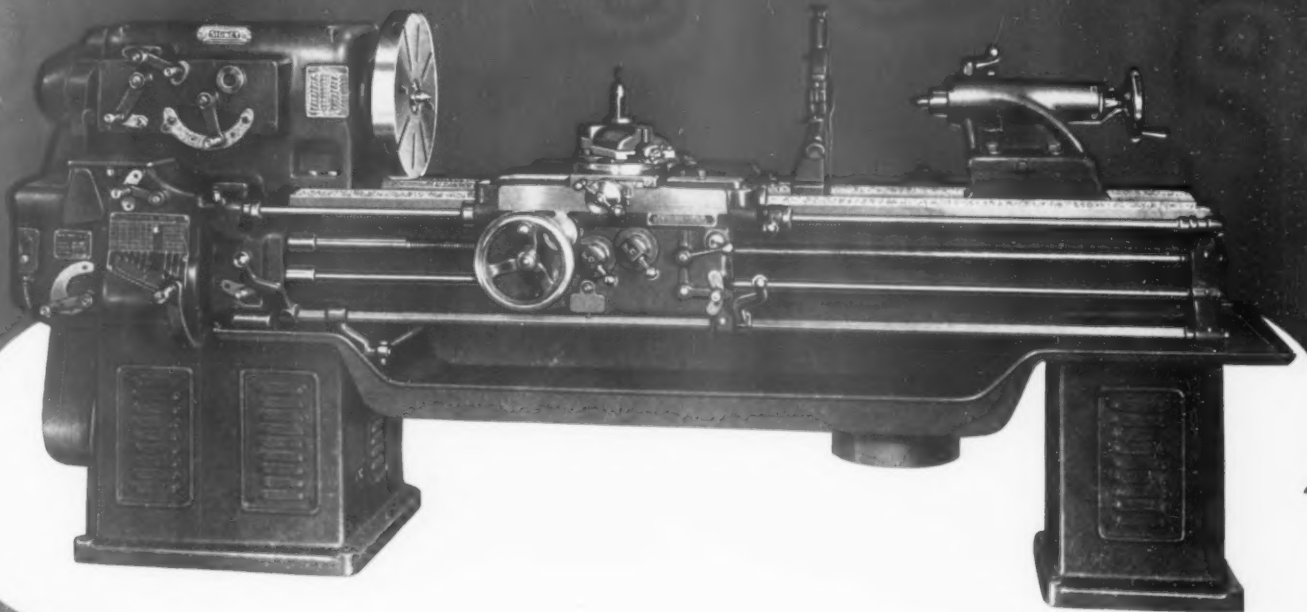
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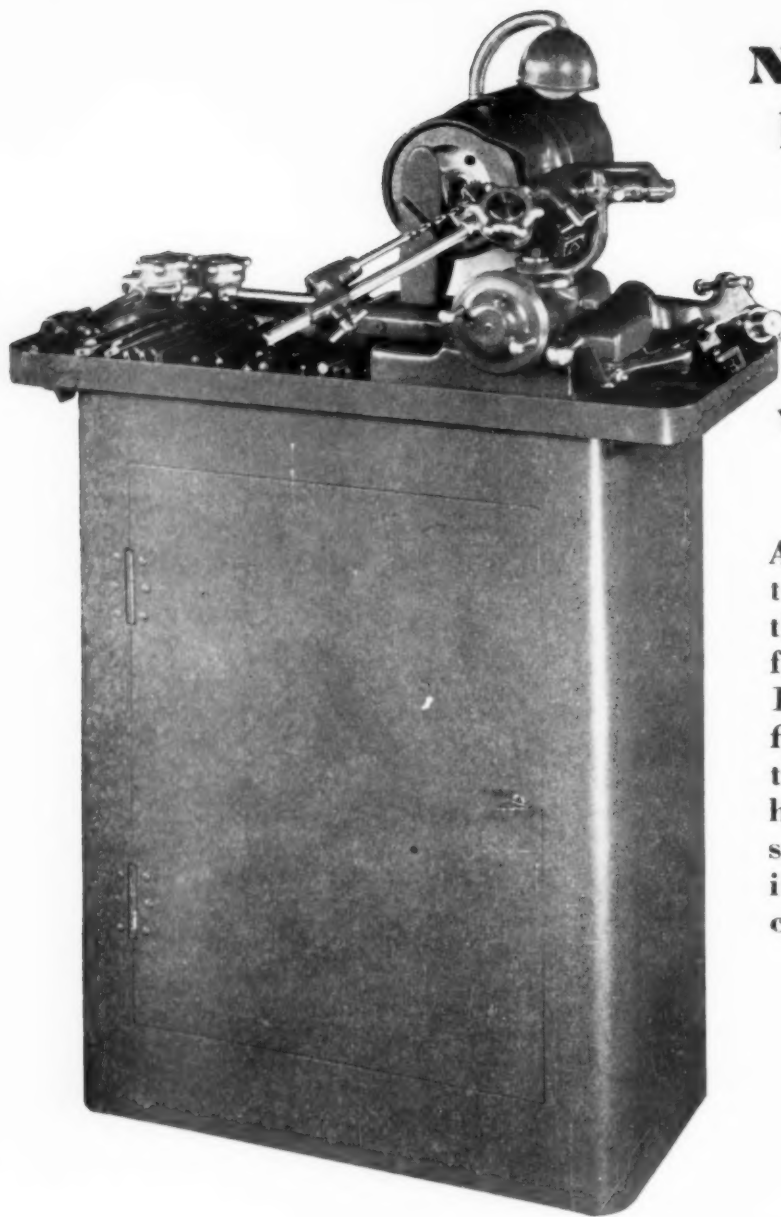


Both have
**SPEED
POWER
ACCURACY**

for
DEFENSE



The **SIDNEY MACHINE TOOL Company**
SIDNEY U.S.A. OHIO



New Convenient Drill Grinding Combination

Sellers No. 1G Drill Grinder with steel cabinet pedestal

A new convenience for operators engaged in drill grinding is the steel cabinet pedestal now furnished with the Sellers Model 1G Drill Grinder. It forms a firm, substantial pedestal for the grinder and the work, and a handy cabinet in which to store supplies and attachments. Cabinet and grinder may be purchased separately, if desired.

The Sellers Model 1G Drill Grinder will grind drills from No. 70 (.028") to $\frac{1}{2}$ " and produces accurate drill points of 160 to 65 degrees included angle—perfect drill points with equal identical lips. Speeds production. Saves skilled labor for production machine work. Saves drills. Write for catalog and prices.

The cabinet has a working space 13" wide by 30" long and stands 31" from the floor. It is of heavy sheet steel, rigidly constructed and braced to form a vibrationless mount for the grinder. There are three shelves of wood (to avoid defacing tools) with a hinged door and fastener. Finish is standard machine tool gray. Weight 175 lbs.



WM. SELLERS & CO., INC. • 1626 Hamilton St., PHILADELPHIA, PA.



Sellers



HOW WE INCREASED OUR GUN BARREL PRODUCTION 5 TIMES

80% Savings in time on *both* Drilling and Boring of 37 mm Gun Tubes

This manufacturer (name on request) is setting a new high in gun tube production. Likewise, if you are using conventional single spindle machines, you can save both time and money with this new two-spindle machine. Study these figures:

DRILLING PRODUCTION:

Previous, 2½ hrs. per barrel, floor to floor
Present, 30 min. per barrel, floor to floor

An average of 1.8 inches feed per minute was used to obtain this production, but with TWO spindles working together, the total penetration rate is 3.6 inches per minute.

BORING PRODUCTION: (Ruff & Fin.)

Previous, 270 minutes per barrel, floor to floor.
Present, 52.5 minutes per barrel, floor to floor.

These are the floor to floor times for boring. In addition, a long guide bushing in the quill permits starting pack-bit directly into the previously drilled hole . . . no starting hole needed.

SAVES 50% IN FLOOR SPACE

Floor space required for this machine is no more than that required for a single spindle machine. Designed for deep hole and cylinder boring operations, it carries no useless gadgets.

CONSTANT FEED PER SPINDLE REVOLUTION

Spindles and hydraulic pumps are driven by the same motor. This feature insures a constant feed per revolution regardless of fluctuation in motor speed due to variance in loads. Tailstock and headstock are coupled by adjustable tie-bars on both sides. This provides a bearing surface four feet longer than part being machined . . . insures a solid footing for the tailstock.

RIFLE DRILLING, CONVENTIONAL DRILLING AND CYLINDER BORING operations are being performed successfully and economically with the 420. The difference in these and their application to this machine are fully described in the free booklet offered at the right.

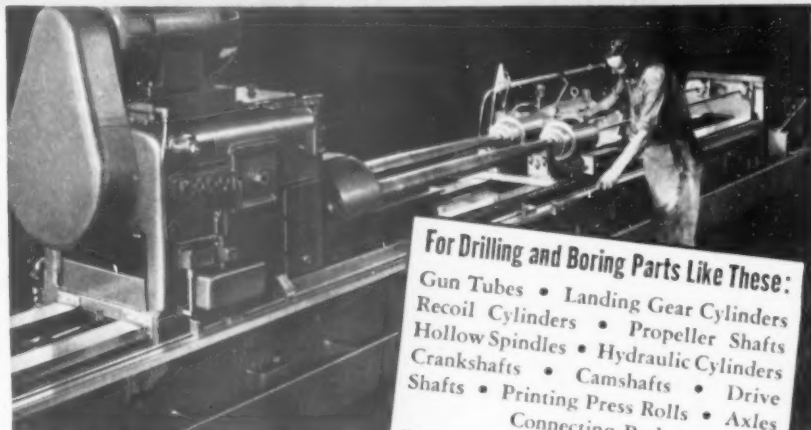
DELIVERIES are better than for standard general purpose machines which are not readily adaptable to deep hole operations. We urge you to investigate the possibilities of this machine and place your order early for earlier delivery.



ROCKFORD

ILLINOIS

JANUARY, 1942



The 420 drilling 37 m/m (1-5/16" Dia.) in gun tube 84" long. Two spindles drill from solid steel at a total penetration rate of 3.6 inches per minute — 1.8 inches per minute feed.

For Drilling and Boring Parts Like These:
Gun Tubes • Landing Gear Cylinders
Recoil Cylinders • Propeller Shafts
Hollow Spindles • Hydraulic Cylinders
Crankshafts • Camshafts • Drive Shafts
Printing Press Rolls • Axles
Connecting Rods
Non-symmetrical parts can be machined by using cradle-type fixtures.

5 IMPORTANT FEATURES

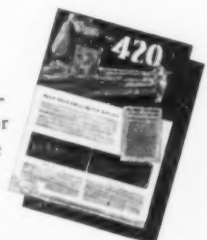
- ★ Two spindles work together . . . double production in same amount of floor space taken by single spindle machine.
- ★ Feeds and spindle speeds always in definite relation . . . constant feed per revolution.
- ★ Massive head together with long bearing surface permits heavy feeds . . . better production.
- ★ Pack bit boring can be done without boring preliminary guide hole — one operation eliminated.
- ★ Hollow spindles permit removal of pack bit without returning through bore . . . no scratches.

5 DEEP HOLE TOOLING

SET-UPS are illustrated in this bulletin. LINE drawings trace coolant path and illustrate cutting operations on drilling, boring, and reaming deep holes. Packed full of useful up-to-date information, this bulletin will help you simplify a tough job.

FREE!

DEEP HOLE DRILLING DATA. Write for this useful deep hole drilling and boring information today. Ask for bulletin T.E. 420.



SOME USERS OF TURNER UNI-DRIVE

American Brake Shoe & F. Co.
Kellogg Division
Southern Wheel Division
Augusta Arsenal
Bendix Aviation Corp.
Burgess Battery Corp.
Cessna Aircraft Corp.
Chicago, Rock Island &
Pacific R. R. Co.
Chicago Screw Company
Combustion Engineering Co.
Doehler Die Casting Co.
Electric Auto-Lite Co.
Frankfort Arsenal
Frisco Lines
Hartzell Industries
Imperial Brass Mfg. Co.
International Projector Co.
Kohler Corp.
Koppers Corporation
Monsanto Chemical Co.
The New York Air Brake Co.
Ohio Pattern and Fdry. Co.
Oneida, Ltd.
Perth Amboy Dry Dock Co.
Republic Steel Corporation
Revere Copper and Brass, Inc.
SKF Industries
The Timken-Detroit Axle Co.
The Todd Company
Wagner Electric Co.
Sullivan Dry Dock Co.



Increase YOUR Production Capacity 25% to 300%

Here's *proved, dependable* aid in stepping up and keeping your production at full speed... the **TURNER UNI-DRIVE**. In many of America's largest plants this *successful* motor drive is speeding production, saving labor and time, cutting power costs. So sure are we that it will prove a big aid in your business that we guarantee Uni-Drives for one year—subject to return for full credit within 60 days if not satisfactory.

UNI-DRIVE eliminates overhead counter shafts. No belts to shift. Increased efficiency of machine and operator. Installed in 2 to 4 hours. All the advantages of geared head with belt drive smoothness. Big saving in power. Sizes $\frac{1}{4}$ to 20 H. P.

Investigate... and be convinced! See your dealer at once, or write to us for full information and prices.

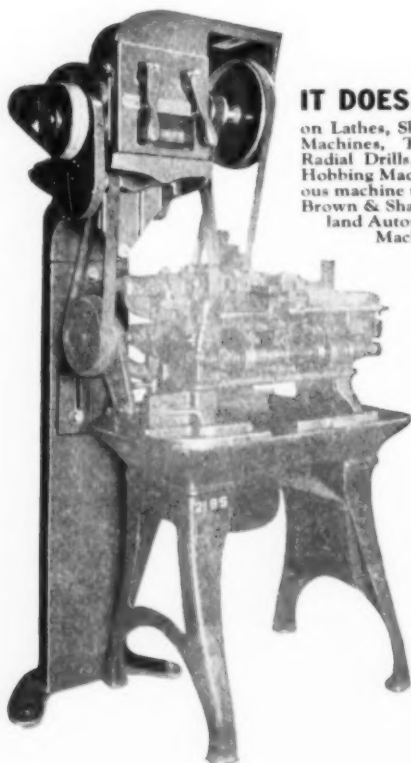
(DEALERS: Write for full details about this fast-moving line for your territory.)

THE TURNER UNI-DRIVE COMPANY

(Sales Division: Turner Machinery Co.)

1638 Central St.

Kansas City, Mo.



IT DOES THE JOB

on Lathes, Shapers, Milling Machines, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines and various machine tools. Also for Brown & Sharpe and Cleveland Automatic Screw Machines.

TURNER
UNI-DRIVE
Motorizes Machine Tools



Don't Gamble

with your cutting tools

Grind for Maximum Tool Life— Use the Norton "B-E" Bond Wheel for High Speed Steels and Stellite

YOU can't afford to take chances today on tool grinding—every minute of useful life from every tool is absolutely essential. And now the grinding must often be done with help that is not too expert, thus creating another problem. Selecting the grinding wheel need not be a gamble, however. For sharpening cutting tools of high speed steel and the cast alloys such as Stellite the outstandingly popular wheel is the Norton "B-E" bond—as near foolproof as a wheel can be made for this type of work.

Patented "B-E" bond gives a wheel of exceptional strength and exceptional uniformity. It holds its shape and has a crisp, cool grinding action. It gives the tools a keen, long-lasting edge, free from burn.

Its type of construction was developed by Norton research to eliminate the gamble, to reduce the risk of damage in tool sharpening—and it does just that.

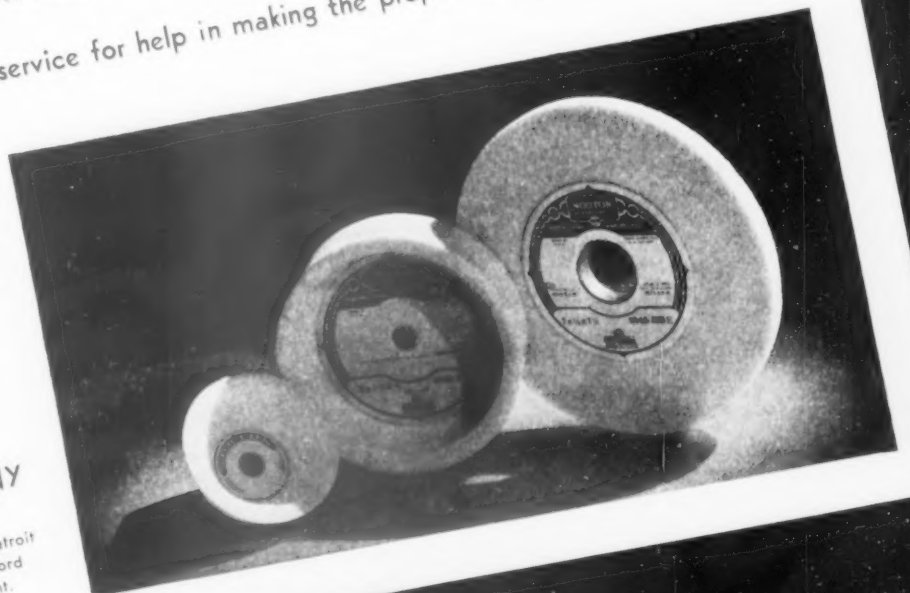
Call on Norton engineering service for help in making the proper selections for your jobs.

For your cemented carbide tools there are Norton Diamond Wheels (Metal Bonded and Resinoid Bonded) and Norton Crystolon Wheels.

NORTON COMPANY
WORCESTER, MASS.

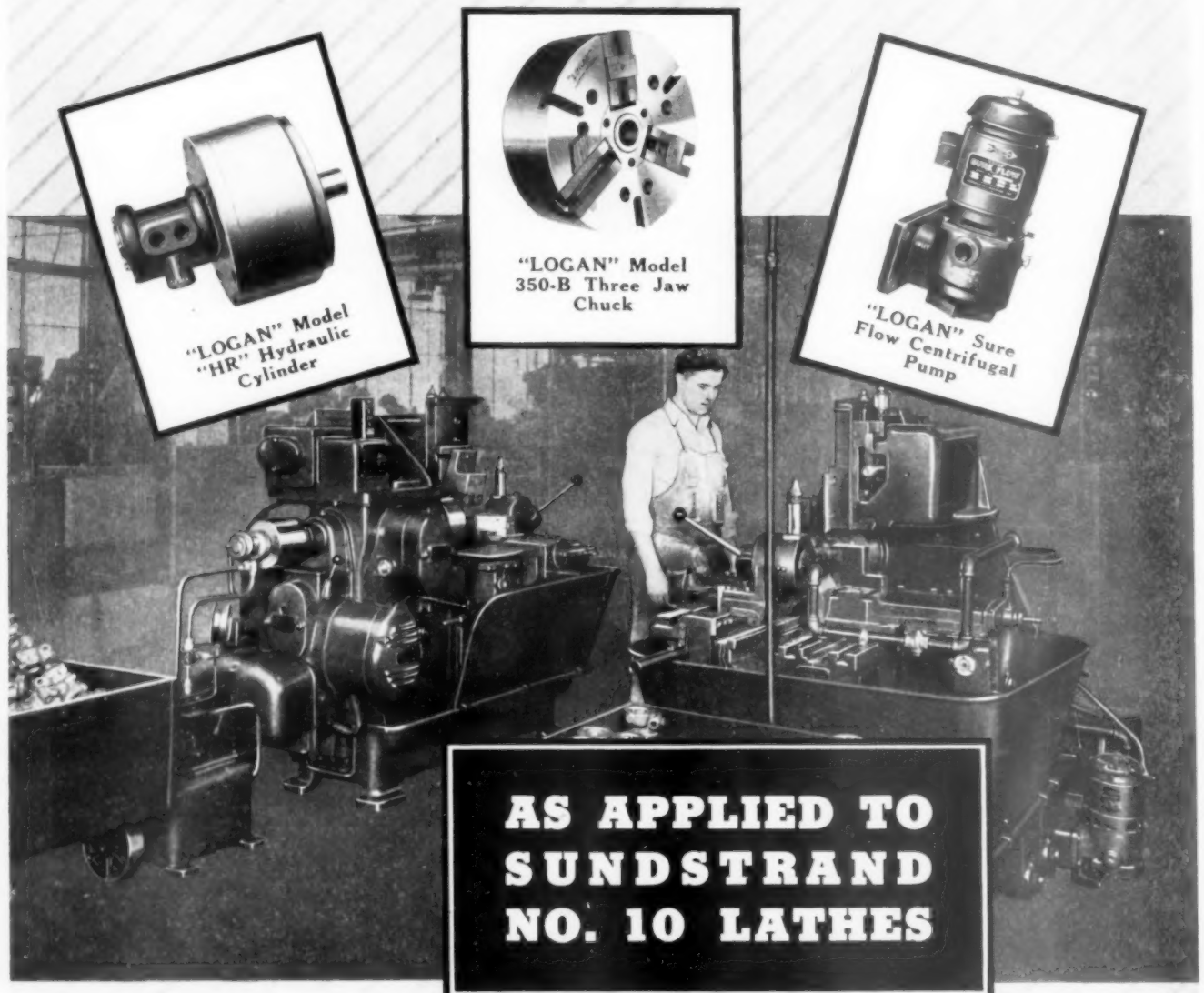
New York Chicago Detroit
Philadelphia Pittsburgh Hartford
Cleveland Hamilton, Ont.

W 846



NORTON ABRASIVES

"LOGAN" EQUIPMENT



**"LOGAN" Model
"HR" Hydraulic
Cylinder**

**"LOGAN" Model
350-B Three Jaw
Chuck**

**"LOGAN" Sure
Flow Centrifugal
Pump**

**AS APPLIED TO
SUNDSTRAND
NO. 10 LATHES**

ILLUSTRATED above are two Model 10 Sundstrand Automatic Lathes equipped with "LOGAN" Hydraulic Cylinders, Chucks, Sure Flow Coolant Pumps and accessories. "LOGAN" Model "HR" double acting, rotating type Hydraulic Cylinders are designed for the efficient operation of chucks and other work holding devices required to be mounted on rotating spindles.

The three-jaw "LOGAN" Chucks provide extra power and exceptional jaw rigidity in heavy duty chucking service. "LOGAN" Sure Flow Pumps assure ample supply of coolant at all times. Let "LOGAN" Sales Representatives and "LOGAN" Engineers make recommendations on your chucking problems.

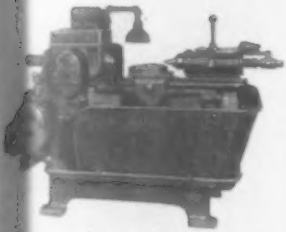
LOGANSPORT MACHINE, INCORPORATED

902 PAYSON ROAD

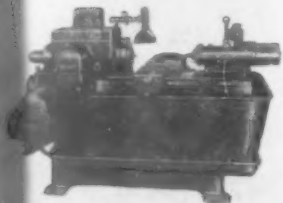
Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories ★

LOGANSPORT, INDIANA

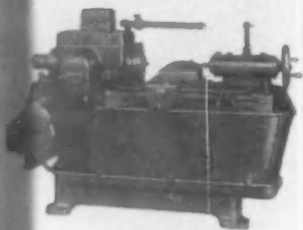
Sundstrand Engineered Production Multiplies Man-Power



Automatic
Stub Lathe
Model 8



Automatic
Stub Lathe
Model 10



Automatic
Stub Lathe
Model 12

Sundstrand Engineered Production Service places at your disposal years of experience, ability, and data acquired in making the most effective applications of our Automatic Lathes, Rigidmils, and other Sundstrand machine tools. It multiplies your man-power by making best use of machine horsepower and automatic cycles . . . gives you maximum production at minimum cost and operator effort. Fast, accurate, labor saving; Sundstrand machine tools are built in standard semi-standard, and special types and sizes that handle a very large variety of the work-pieces you are being called upon to produce at top speed.

Automatic . . . Sundstrand machine tools are automatic after starting; motor power relieves man-power, operators work more easily, run additional machines without special effort. Rigidmils with hand feed are available when operations warrant their use.

Productive . . . Sundstrand machine tools work modern cutting materials to full capacity in high-speed cycles having hydraulic, electrical, and mechanical actuation in various combinations. Speed is accompanied by ample power, strength, and rigidity for all work in the capacity of each machine.

Adaptable . . . Easy set-up, quick change-over, and extremely simple operation are notable Sundstrand qualities. Standard Automatic Stub Lathes and Rigidmils set new high records on mass production, are equally effective on short-run work. Semi-standard and specially equipped Sundstrand machines frequently can be used on different jobs by making simple changes.

At your Service . . . Our representatives are eager to help you benefit by the enormous productive capacity, flexibility of application, and economy in Sundstrand machine tools . . . they will get Engineered Production proposals for you promptly . . . work with you on priorities and earliest available deliveries. Consult them, today.

No. 00
Rigidmil
Hand Feed



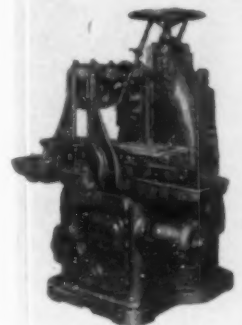
No. 00
Rigidmil
Hydraulic
Feed



No. 0
Rigidmil
Hydraulic
Feed



No. 1
Rigidmil
Hydraulic
Feed



SUNDSTRAND MACHINE TOOL CO.

2532 ELEVENTH STREET, ROCKFORD, ILLINOIS, U. S. A.

WANT DETAILS QUICKLY?

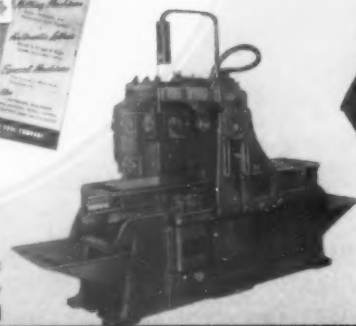
Booklet shown at right contains condensed descriptions of all Sundstrand products and services. Write, today, for your copy. Ask for Bulletin GC-1.



Special
Rigidmil



No. 33 Duplex
Fluid-Screw
Rigidmil



No. 33 Simplex
Fluid-Screw
Rigidmil



No. 2 Electromil

BAKER

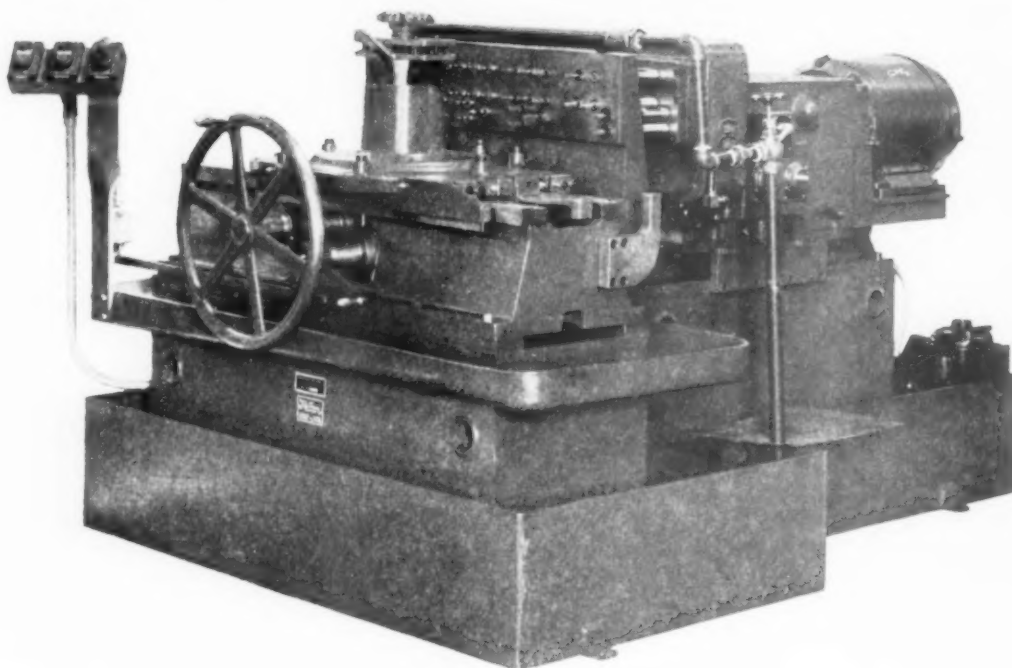
HORIZONTAL HYDRAULIC FEED UNIT TYPE MULTIPLE DRILLING MACHINES

Illustrating a new arrangement of BAKER 5A12 self-contained hydraulic feed unit with multiple head with cross index table for multi-operation.

Part handled—Air craft engine magnesium casting.

Operation — Multiple drill, ream and countersink 15 holes in governor pad.

The holes which are drilled, reamed and countersunk are at close center distance within an area of 5" by 6". Due to close center distance of holes, it is necessary to split the drilling and reaming operations. Machines handle the drilling at two stations, the reaming and countersinking at two stations.



To meet the present day demand for increased production in the aircraft industry we are prepared to furnish not only vertical type multiple spindle machines, but horizontal unit type machines as well. We illustrate a one-way hydraulic unit horizontal type machine with multiple head with a hand operated cross indexed fixture for giving the increased output demanded and at low labor costs.

The illustrated machine is novel due to the fact that the operator, in his normal operating position, stands at end of machine allowing for convenient loading and unloading of part.

Particular care has been emphasized in the designing of this special tooled machine for convenient operation. Note the mounting of push-button or electrical control convenient to operator.

Fixture is mounted on hand traversed table, which table is mounted on hardened steel ways.

Part handled is chucked over the center plug and located from male diameter on part with radial location from dowel pin with quick acting clamps on top.

We offer our self-contained hydraulic feed unit for application not only for one-way horizontal machines as shown, but for two-way, three-way or four-way horizontal application as well as vertical and angle mounting.

Our Motto Since 1867:

"MACHINES: STURDY AND EFFICIENT, AS FINE AS CAN BE BUILT"

BAKER BROTHERS, INC.,

TOLEDO,
OHIO, U.S.A.



New Victories
for these
NEW TURRETS!

*Look ahead... keep ahead...
with Gisholt improvements
in metal turning*

We've been advancing rapidly all along the machine tool front—winning new victories over shortages of time and manpower on hundreds of machining operations.

Yes, today the new Gisholt Turret Lathes are turning metals for many vital parts in less than one-half the time required only a few years ago. And with far greater accuracy, too!

That's progress—the kind of progress that is backing up America's swift-moving defense program! And it's the kind of progress that is important to you, as a manufacturer.

When you plan increasing production, now or in the future, investigate the many ways these new Gisholts can save minutes, manpower, and money.



GISHOLT MACHINE COMPANY

1229 EAST WASHINGTON AVENUE • MADISON, WISCONSIN

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

**"STANLEY
SURE KNOWS HOW
TO BUILD TOOLS!"**



STANLEY UNISHEAR cuts sheet metal any pattern to hairline accuracy. Fast, too. No. 16 (shown) cuts up to 16 gauge hot rolled steel.



STANLEY CONTOUR GRINDER. A time saver on such jobs as making templates, grinding dies and finding blanks, correcting hardening distortions.



STANLEY GRINDER AND SANDER, for sanding wood or metal. In general use for smoothing castings and heavy welds, removing rust and paint, scouring and cleaning vats.



STANLEY NO. 153 GRINDER, for free-hand or tool-post grinding. Well balanced, fluted for comfortable grip. Can be fastened in a lathe, milling machine or shaper. Weighs only 5 pounds.

STANLEY

As a matter of fact we've been building good tools for a long time.

Right now, Stanley Electric Tools are helping to do a lot of jobs much faster and better than they would otherwise be done. We build tools for industrial use. That's why they are especially rugged and have plenty of extra power.

Why not ask a Stanley Distributor for a demonstration, or write for literature on the tools you can use to best advantage. Stanley Electric Tool Division, The Stanley Works, New Britain, Connecticut.

STANLEY
ELECTRIC TOOLS

*** A Complete Line for Industry ***

A NEW 20 INCH DRILL PRESS

... with smooth, positive POWER FEED

This new Drill Press was designed especially to meet today's extraordinary production needs. Its compact, smooth-acting Power Feed operates through a clutch and can be engaged at any point, regardless of spindle position. Unusually well balanced, it operates with equal precision at speeds as low as 260 r.p.m. and as high as 5200 r.p.m., drilling holes from $\frac{1}{16}$ " to 1". Study the quality features described in the drawing at extreme right and in specifications below - then mail the coupon for further details.

SPECIFICATIONS

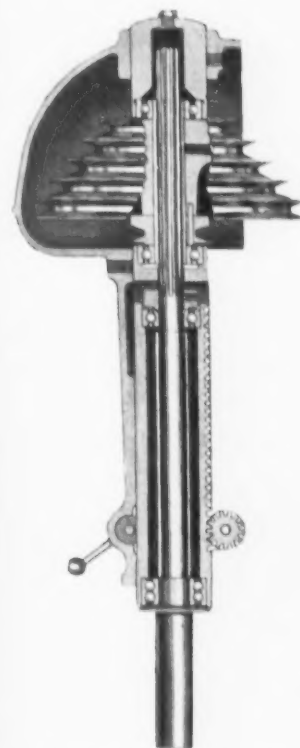
CAPACITY-Drills to center of 20" circle. Feed 6". Drills $\frac{3}{4}$ " hole in steel, 1" in cast iron.

SPINDLE SPEEDS-With 1140 r.p.m. motor: 260, 520, 800, 1200, 1700 r.p.m. With 1740 r.p.m. motor: 400, 800, 1200, 1800, 2600 r.p.m. With 3450 r.p.m. motor: 800, 1600, 2400, 3600, 5200 r.p.m. Special 2-speed motor also available for 3-phase only.

OVERALL DIMENSIONS - Head, front to back, with guard 32". Width 14". Column 33 $\frac{1}{4}$ ". Height (Floor Model) 74". Table working surface 14" x 18".

POWER FEED-Available with or without power feed. This unit, powered from drill press spindle, has positive clutch and sensitive automatic trip and return. Four feeding speeds: .003", .006", .009", .012" per spindle revolution. Positive depth stop.

MODELS-Single and multiple spindle models available with or without power feed. Single spindle drill presses also available with foot feed.



The solid head casting is precision-bored to fit the machined column and quill. Four precision deep-groove ball bearings assure smooth, frictionless operation of spindle. Bearing above and below the straddle-mounted pulley take the belt strain evenly, preventing whip.

WALKER-TURNER COMPANY, INC.
4912 Berckman St., Plainfield, N. J.

Send complete specifications and description at once.

Name

Position

Company

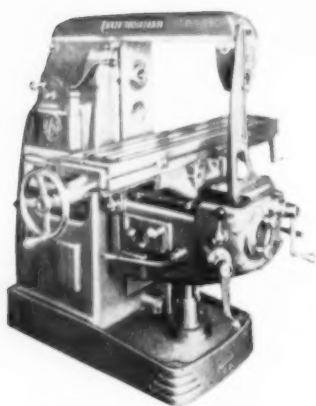
City..... State

**walker-
Turner**

COMPANY, INC.
PLAINFIELD, N. J.
U. S. A.

WALKER-TURNER MACHINE TOOLS
FOR METAL, WOOD AND PLASTICS

DRILL PRESSES • BAND SAWS • BENCH SAWS • TILTING ARBOR SAWS • LATHES
JIG SAWS • RADIAL SAWS • RADIAL DRILLS • BELT AND DISC SURFACERS • JOINTERS
SPINDLE SHAPERS • GRINDERS • FLEXIBLE SHAFT MACHINES • CUSTOM BUILT MOTORS



The Sheffield Corporation Mills Gage-Parts Faster and Easier on

To delicate work like the precision gages made by The Sheffield Corporation of Dayton, Van Norman's No. 2-L Knee-Type Horizontal Miller brings new accuracy, speed, and ease of control. For No. 2-L combines unusual compactness with exceptional rigidity and dependability . . . rugged strength with extreme sensitivity . . . and highest accuracy with greatest ease of control.

Operating convenience is provided by front and rear directional controls of power feeds and 6-way rapid traverse, which are always right at the operator's finger-tips. 18 speed changes are available through the exclusive Van Norman single-lever speed selector. And spindle-clutch lever is within easy reach on left of column. Accuracy is safeguarded by massive, rigid construction . . . especially the large and heavy table, knee and saddle assemblies . . . by extra-heavy spindle transmission . . . and dials that are large enough to be plainly and easily read. The Van Norman No. 2-L is made both in plain and universal models, and has a work-holding surface 45" x 10". Write for facts.

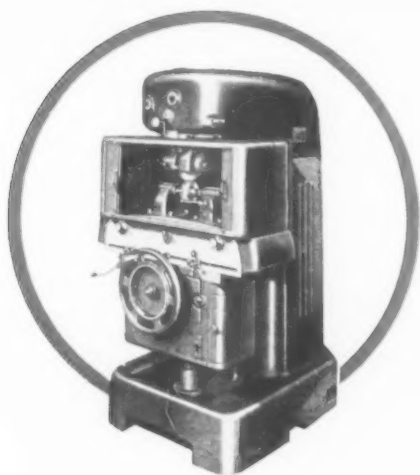
VAN NORMAN

No. 2-L HORIZONTALS



VAN NORMAN MACHINE TOOL COMPANY
SPRINGFIELD, MASSACHUSETTS

VAN NORMAN
Milling Machines

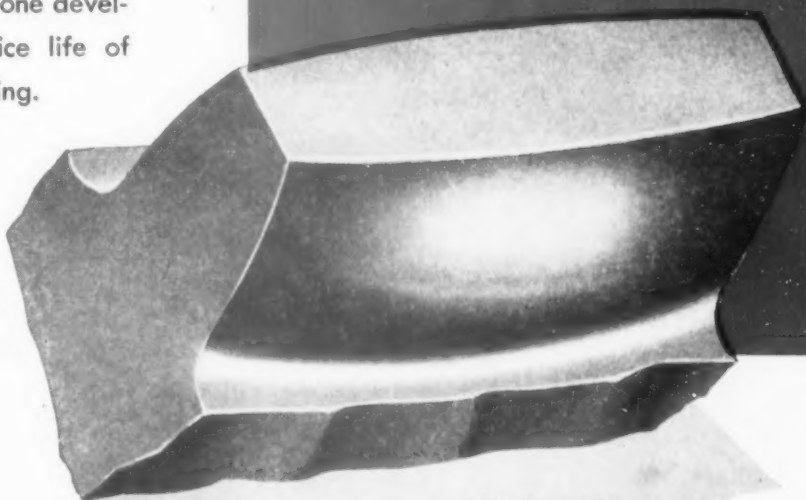


Red Ring Rotary Shaving finishes gear tooth surfaces accurately—faster than other methods and without producing any of those microscopic cracks in the tooth surface which are so hard to avoid with other gear finishing methods—and which are so prolific of fatigue failures in service. A Magnaflux test on shaved aircraft gears shows this conclusively.

This Patented Rotary Shaving Process which provides the Elliptoid Tooth Form has done more than any other one development to increase the service life of gears by eliminating end bearing.

Red Ring Shaving is an automatic process that is fast and economical. No skill is required in machine operation. It may, but need not, be followed by Red Ring Crossed Axes Lapping.

MAGNAFLUX TEST *proves* SUPERIORITY OF SHAVED GEARS



**Write for
Descriptive Bulletins**

**NATIONAL BROACH
AND MACHINE CO.**

RED RING PRODUCTS

5600 ST. JEAN • DETROIT, MICH.

**SPECIALISTS ON SPUR AND HELICAL
INVOLUTE GEAR PRACTICE**

**ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORMS**

SAVE MONEY QUICKLY^{*}

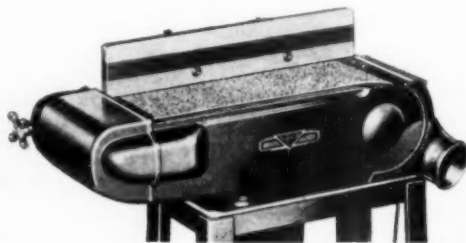
with these Low-Cost Abrasive Belt Finishing Machines

***One manufacturer stepped up production 600%!**

There's a place in your shop to reduce costs and save money with this Delta 6" belt-type Abrasive Finishing Machine. It's heavy and husky enough to handle any of the dozens of sanding and polishing operations around the shop—and yet is portable enough to be moved just where it is needed. Many shops are using this machine for polishing and sizing metal parts ("in one plant making precision instruments, production was increased 600% by the use of this Delta machine).

Die-casters, also, use it as a finishing and polishing machine, with a great saving in power cost over larger machines. For finishing, fining and surfacing plastic parts, it has found wide acceptance. Many shops have used combinations of this unit to make up special machines at a great saving. It is adaptable for practically any small industrial finishing operation.

**HAS
MANY
UNUSUAL
FEATURES**



Completely Enclosed— Thoroughly Guarded

Only the portion of the belt that is being used is open, the ends and bottom of the belt, as well as the drums, being completely covered. The guard covering the end drum may be removed in a moment, for use in finishing long materials, or for curved work. This complete enclosure also increases the efficiency of the dust removal system.

Completely Ball- Bearing Equipped

Double-seal bearings, lubricated at the fac-

tory for life. No rubber covering required on drums, thus eliminating one source of replacement expense. Adjustable deflector on drum hood catches practically all dust. Hood is provided with suction spout. This machine may be set horizontally, as shown above and equipped with a wood fence for edge or face sanding, if required. Or it may be used vertically, in connection with the 7 1/2" x 14 3/4" tilting table as shown to the right. Cloth-backed belts, 6" wide by 48 3/8" long. Aluminum-oxide belts for metal finishing. Adjustable fence for edge sanding and adjustable back stop for flat sanding are available for use in horizontal position.



SEND FOR FULL DETAILS

For complete specifications and low prices on Delta Abrasive Belt Finishing Machine send coupon below for latest Delta Catalog.



THE DELTA MFG. CO.
609-A E. Vienna Ave., Milwaukee, Wis.

Gentlemen: Please send me latest Delta Catalog giving full details on your Abrasive Belt Finishing Machine and other low-cost high quality Delta machines.

Name

Address

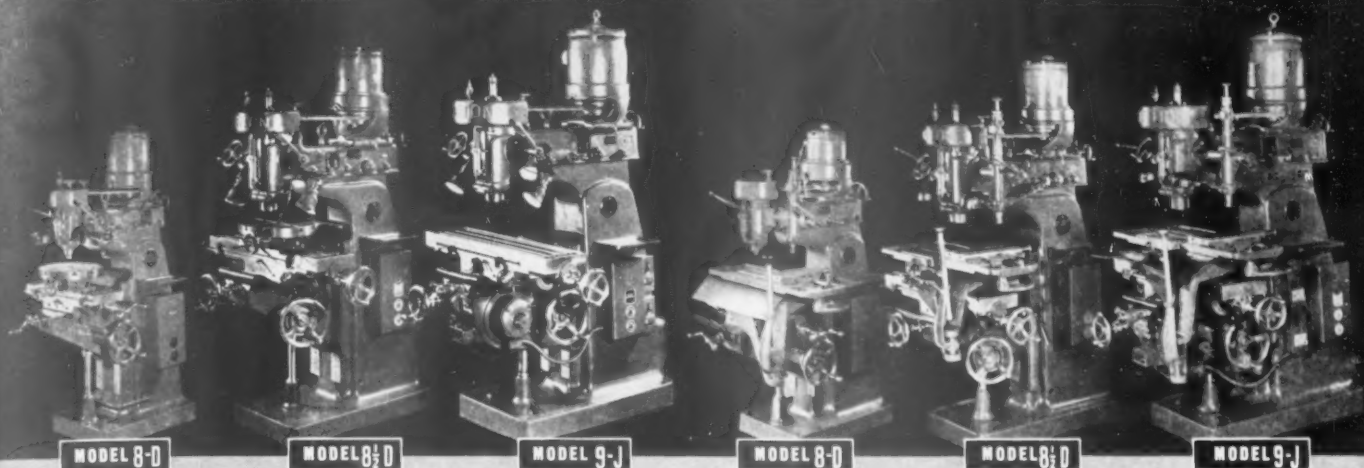
MODERN **GORTON** MACHINES

ASSURE FUTURE ECONOMIC SAFETY

Purchase the Modern 1942 Machine Tools—needed for present emergencies—that can later be used to reduce your production costs . . . help you maintain profits in highly competitive markets.

Use George Gorton Specialized Engineering Service to assist you in the selection of the right cost-reducing equipment for die making, engraving and vertical milling. Recommendations without obligation.

Vertical Milling Machines ★ **GORTON SUPER-SPEED** ★ Duplicating Machines



For Light Production Milling—Tool Work—and Jig Boring

For Duplicating Multiple Dies and Molds from Originals

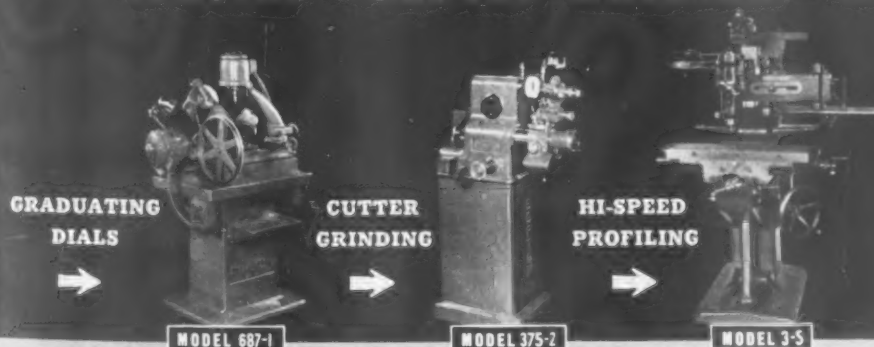
2 Dimensional ★ **PANTOGRAPH ENGRAVING MACHINES** ★ 3 Dimensional



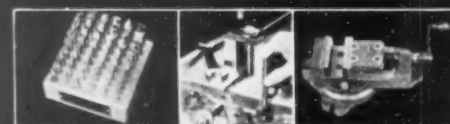
For Engraving Letters and Designs from Templates

For Reproducing Intricate Dies from Models

SPECIAL PURPOSE MACHINES AND ACCESSORIES



Gorton Circular Tables—Accurate to 5 Minutes of Arc



Cutter Sets T-Slot Nuts Vises & Holders

WRITE FOR FREE CATALOGS giving complete information on GORTON 1942 Machine Equipment
 No. 1400-A—Super Speed Vertical Milling Machines No. 1580-A—Pantograph ENGRAVING Machines
 No. 1319-C—Die and Mold DUPLICATORS No. 1317-D—Time-Saving ACCESSORIES, Small Tools

GEORGE GORTON MACHINE CO.
 1322 RACINE STREET, RACINE, WISCONSIN, U.S.A.



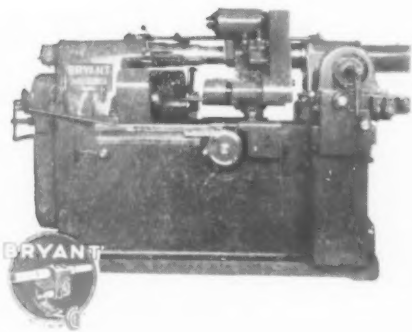


Put in a phone call for Bryant

"Operator, give me long distance — Springfield, Vermont, FIVE - SIX - O:
Bryant Chucking Grinder Company — station to station."

When bothersome questions crop up on internal grinding jobs, time and money can often be saved if you put in a phone call for Bryant.

Whether the answer can be given at once in so many words, or whether Bryant can help you more by dispatching bulletins, memos, blueprints or even a service crew to the scene of action, you can count on a prompt response when you put in a phone call for Bryant.



Bryant's productive capacity, already tripled, is constantly increasing. No other organization in America of comparable size and experience is devoted *exclusively* to designing and building machinery for internal grinding work.

Not only should Bryant engineers be able to help you speed defense, but they welcome opportunities to begin work, *at the earliest possible stage* on new products for post-war markets.

If you believe in planning ahead, put in a phone call for Bryant.

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

Defense Savings Pay-Roll Allotment Plan

Now company heads can help their country, their employees, and themselves

voluntary
pay-roll
allotment
plan { helps workers provide for the future
helps build future buying power
helps defend America today

This is no charity plea. It is a sound business proposition that vitally concerns the present and future welfare of your company, your employees, and yourself.

During the post-war period of readjustment, you may be faced with the unpleasant necessity of turning employees out into a confused and cheerless world. But you, as an employer, can do something *now* to help shape the destinies of your people. Scores of business heads have adopted the Voluntary Pay-roll Allotment Plan as a simple and easy way for every worker in the land to start a systematic and continuous Defense Bond savings program.

Many benefits . . . present and future. It is more than a sensible step toward reducing the ranks of the post-war needy. It will help spread financial participation in National Defense among all of America's wage earners.

The widespread use of this plan will materially retard inflation. It will "store" part of our pyramiding national income that would otherwise be spent as fast as it's earned, increasing the demand for our diminishing supply of consumer goods.

And don't overlook the immediate benefit . . . money for defense materials, quickly, continuously, *willingly*.

Let's do it the American way! America's talent for working out emergency problems, democratically, is being tested today. As always, we will work it out, without pressure or coercion . . . in that old American way; each businessman strengthening his *own* house; not waiting for his neighbor to do it. That custom has, throughout history, enabled America to get things done *of its own free will*.

In emergencies, America doesn't do things "hit-or-miss." We would get there eventually if we just left it to everybody's whim to buy Defense Bonds when they thought of it. But we're a nation of businessmen who understand that the way to get a thing done is to *systematize* the operation. That is why so many employers are getting back of this Voluntary Savings Plan.

Like most efficient systems, it is amazingly simple. All you have to do is offer your employees the convenience of having a fixed sum allotted, from each pay envelope, to the purchase of Defense Bonds. The employer holds these funds in a separate bank account, and delivers a Bond to the employee each time his allotments accumulate to a sufficient amount.

Each employee who chooses to start this savings plan decides for himself the denomination of the Bonds to be purchased and the amount to be allotted from his wages each pay day.

How big does a company have to be? From three employees on up. Size has nothing to do with it. It works equally well in stores, schools, publishing houses, factories, or banks. This whole idea of pay-roll allotment has been evolved by businessmen in cooperation with the Treasury Department. Each organization adopts its own simple, efficient application of the idea in accordance with the needs of its own set-up.

No chore at all. The system is so simple that A. T. & T. uses exactly the same easy card system that is being used by hundreds of companies having fewer than 25 employees! It is simple enough to be handled by a check-mark on a card each pay day.

Plenty of help available. Although this is *your* plan when you put it into effect, the Treasury Department is ready and willing to give you all kinds of help. Local civilian committees in 48 States are set up to have experienced men work with you just as much as you want them to, and no more.

Truly, about all *you* have to do is to indicate your willingness to get your organization started. We will supply most of the necessary material, and no end of help.

The first step is to take a closer look. Sending in the coupon in no way obligates you to install the Plan. It will simply give you a chance to scrutinize the available material and see what other companies are already doing. It will bring you samples of literature explaining the benefits to employees and describing the various denominations of Defense Savings Bonds that can be purchased through the Plan.

Sending the coupon does nothing more than signify that you are anxious to do *something* to help keep your people off relief when defense production sloughs off; *something* to enable all wage earners to participate in financing Defense; *something* to provide tomorrow's buying power for your products; *something* to get money *right now* for guns and tanks and planes and ships.

France left it to "hit-or-miss" . . . and *missed*. *Now* is the time for *you* to act! Mail the coupon or write Treasury Department, Section A, 709 Twelfth St. NW., Washington, D. C.



FREE - NO OBLIGATION

Treasury Department, Section A,
709 Twelfth St. NW., Washington, D. C.

Please send me the free kit of material being used by companies that have installed the Voluntary Defense Savings Pay-Roll Allotment Plan.

Name _____

Position _____

Company _____

Address _____

Information

About Our Production

We wish you could see our plant right now. If you could, you'd understand, a lot better, why your orders have been delayed.

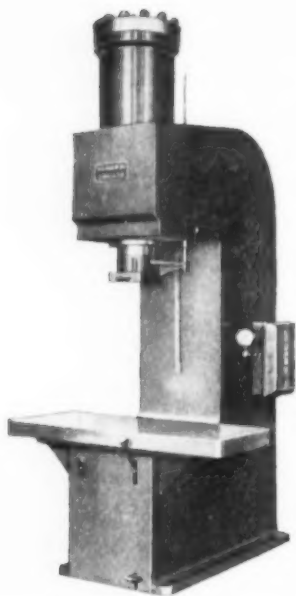
The situation is that our business is practically double that of last year! The rush of jobs caused by National Defense work really taxed our capacity. For a while, with all those extra orders pouring in, we were really "snowed under."

But as fast as we could, we've added more floor space—added more equipment—added more skilled men in every department. Now, with our increased plant capacity, and facilities, it looks like much clearer sailing ahead.

We want to tell all you loyal customers how much we've appreciated your helpful, cooperative attitude. We know that some of you were inconvenienced by our slow deliveries, and we're sincerely sorry. But we want you to know of our improved facilities, and to assure you that your orders will be taken care of just as efficiently and promptly as the national emergency will permit. And thanks again for your splendid cooperative spirit!

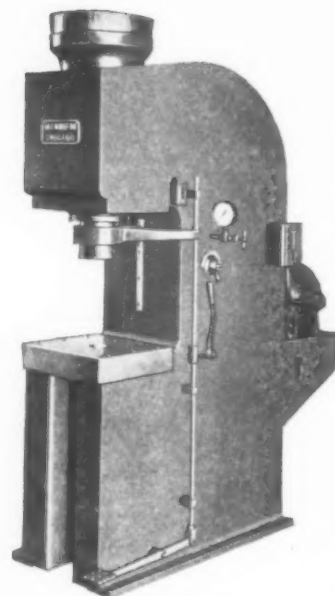
DAVIS BORING TOOL DIVISION
Larkin Packer Co., Inc., St. Louis, U. S. A.



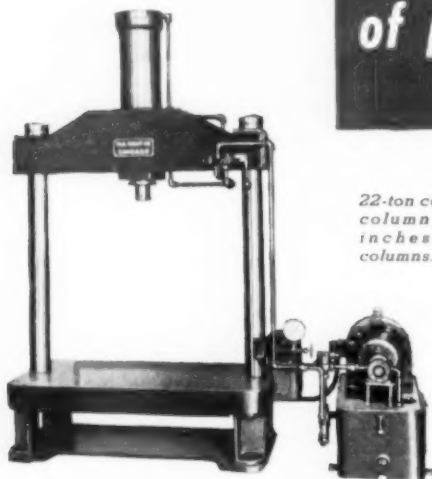


75-ton forcing and straightening press, 28 inch stroke. Both hand lever and foot pedal sensitive pressure control.

50-ton general purpose hydraulic press. Stroke 14 in., reach 10 in. Both hand and foot control. Adjustable maximum pressure. Adapted to a variety of production operations.

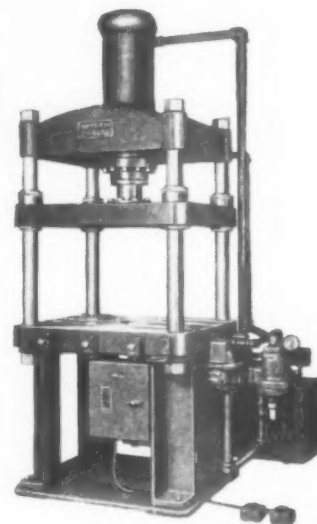


**Investigate
this fast, accurate,
easy handling
of press operations**



22-ton capacity two column press, 48 inches between columns.

75-ton standard 4 column hydraulic press, 36 inches between columns. Alternate hand or foot operated push-button control.



Hannifin hydraulic presses for straightening, forming, press-fit assembly and similar press operations are available in many types, all with one feature in common: skilled engineering attention has been devoted to providing simple handling of work and simple control of the press operation. Skillful, accurate handling is made easier for the operator with simple, natural control, adapted to the needs of the work, with consequent increases in production and improvement in quality. Hannifin sensitive pressure control, available on many different types of Hannifin presses, provides an infinitely variable control of ram pressures by either hand lever or foot pedal. Any

ram pressure up to full capacity is available at a finger-tip touch, in proportion to the amount of control lever movement.

Hannifin press construction with welded frames, built-in hydraulic power units, and sensitive, accurate control, permits flexibility in design to meet individual needs. Table construction, gap, reach, and ram stroke are readily modified in Hannifin standard size presses. Ram stroke is adjustable, to avoid unnecessary up-travel of the ram on production operations.

Write for bulletins giving specifications of many types.

HANNIFIN MANUFACTURING COMPANY
621-631 South Kolmar Avenue • • Chicago, Illinois

Detroit representative: R. A. Bean, Hayward Building, 4829 Woodward Avenue, Telephone Columbia 4949

HANNIFIN hydraulic PRESSES



Tool Engineers—Key to Victory

FOR the past year this publication has been stressing the fact that so far World War II has been a war in which the emphasis is upon production; in which the soldier is relatively unimportant, *the engineer supremely important*.

Last April, we commented editorially that "Changing from a peacetime to a war time status involves many serious problems. Such problems are the more complicated when that nation attempts, through the democratic process, to make the transfer without an open declaration of war."

Time and the Japanese have relieved us of many of these problems. The nature of the attacks made upon us, while sinking to a new low in diplomatic treachery, served as could nothing else to unite us.

The Tool Engineer's job has often been discouraging in the past year. He has had to cope with the inherent problems of production, he has been deterred by problems of labor shortages, strikes, slowdowns; his work has been disrupted by public and political lethargy, and he has been delayed by material shortages and design changes.

It is with relief that Tool Engineers now find all problems relating to labor and peacetime lethargy removed. But, they must be prepared for intensification of material shortages and design changes. We can expect that a system of allocation will replace the priorities setup, and that this will handle the materials problem as expeditiously as possible.

We can expect no short cut to remove design changes; in this war there can be no frozen designs.

War material is a little like a parachute. You can test it in the laboratory as much as you please but you cannot be sure that a new design will work until it is actually used in combat. If the parachute fails to open, if the fabric tears, if the shrouds break, if the diameter is too small and it falls too fast then you would not expect to continue production of that design, but would change it immediately upon the basis of experience gained from the failure.

Because of the Lend-Lease program we have had an opportunity to examine some of our ordnance under actual fighting conditions. Tanks, for example, that looked invulnerable on paper, impressive on the testing ground, and invaluable in sham maneuvers, developed defects when placed in actual service in Libya. It was found that their high construction made them an easy target, their low guns prevented firing from concealment behind low hills and, perhaps worst of all, that rivets struck by shell fire had their heads sheared off and the resultant red hot rivets caroming about within the tank became as deadly as shrapnel.

Already these faults are being corrected; new designs are lower, guns are higher, welding is replacing riveting in the assembly of armored plate.

There will be no *yearly* model changes, there will most likely be constant changes. Tool Engineers face the mightiest challenge of their history as they undertake the task. They will work as they have never worked before, they will bring to the job all their accumulated experience and ingenuity, for upon their shoulders will rest ultimate Victory.

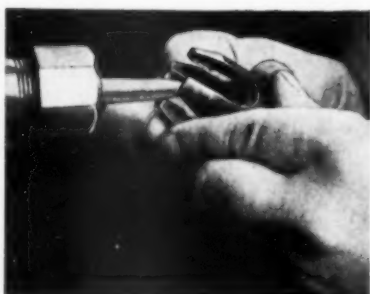
WASTE NOT... WANT NOT

"Acorn" Dies will cut perfect threads until repeated sharpenings have ground away more than half of the lands. Now that universal demand makes it hard to get all the dies you need, be sure you get full value from your present stock—by using them until further grinding is not practical. Here's the way to sharpen them so they will last longest and cut best.

To grind the cutting face hold the die as in the illustration and grind the cutting face on a saucer wheel. Take light cuts so as not to burn the threads. Maintain the original angle of the cutting face with relation to "center" (see diagram). See that the same amount of metal is removed from each land.

Grind the chamfer at the die's throat with a pencil wheel. (See below.) Put a slight relief on the chamfer; that is, remove more metal toward the heel than at the face. Use a solid rest for your hands to hold the die steady.

Special holders can be obtained for the smaller size dies which are difficult to handle.



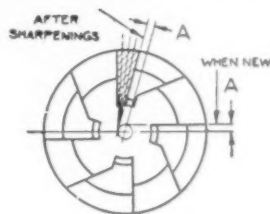
Grinding chamfer with pencil wheel

If properly ground, the die will still cut perfect threads, even though the lands are quite thin.

Actually "Acorn" Dies are very easy to sharpen and a little practice will enable anyone to do a good job and double or treble their normal life.



Grinding face on saucer wheel



When grinding the face, maintain original cutting angle this way

This is one of a series of advertisements published by Greenfield Tap and Die Corporation to help users get greater production from their small tools in these critical times, through making useful facts more widely known

GREENFIELD TAP AND DIE CORPORATION • GREENFIELD, MASS.

DETROIT PLANT: 2102 West Fort St.

WAREHOUSES in New York, Chicago and Los Angeles

In Canada: GREENFIELD TAP AND DIE CORP. OF CANADA, LTD., GALT, ONT.

GT D GREENFIELD

TAPS • DIES • GAGES • TWIST DRILLS • REAMERS • SCREW PLATES • PIPE TOOLS

The best machine tool is a liability unless equipped with proper cutting tools, properly sharpened. Here are some practical ideas on using cutting tools most effectively today.



Controller Wise

Getting the Most Out of Cutting Tools

By ROY T. WISE

Deputy Machine Tools Controller
Dominion of Canada

IF you had the best milling machine in the world and did not have cutters, it would be a liability and not an asset. On the other hand, if you had a milling machine and cutters but used the cutters until they were dull and did not have proper means to sharpen them, then both the cutters and the machine would be a liability.

It is also of great importance to select the right cutters for the work to be done, so that the maximum productive capacity of the machine can be obtained. We are concerning ourselves with three major problems.

1. The selection of the right tools to do the work.
2. The proper sharpening and maintenance of the tools so that they will produce the greatest number of parts.
3. The right application of the tools so that the maximum productive capacity of the machine tools on which they are used may be obtained.

The cutter shown in *Figure 1* illustrates some of the more desirable features of a correctly designed cutter. It has a spiral flute of 45° . It has rake angle back of the cutting edges and has been properly sharpened. These details will be further developed as we go along.

The use of the right grinding wheels in sharpening cutters is of great im-

portance. *Figure 2* shows a cutter tooth magnified 100 times — sharpened with the right grinding wheel but unfortunately, dressed with a stick which transferred all of the irregularities of this stick into the face of the grinding wheel, which were in turn transferred to the cutter tooth. When the cutter contacts the work, the high points shown will break off and the cutter will be dull before it has an opportunity to do any work. A cutter sharpened like this one produced 20 pieces before it was necessary to re-sharpen.

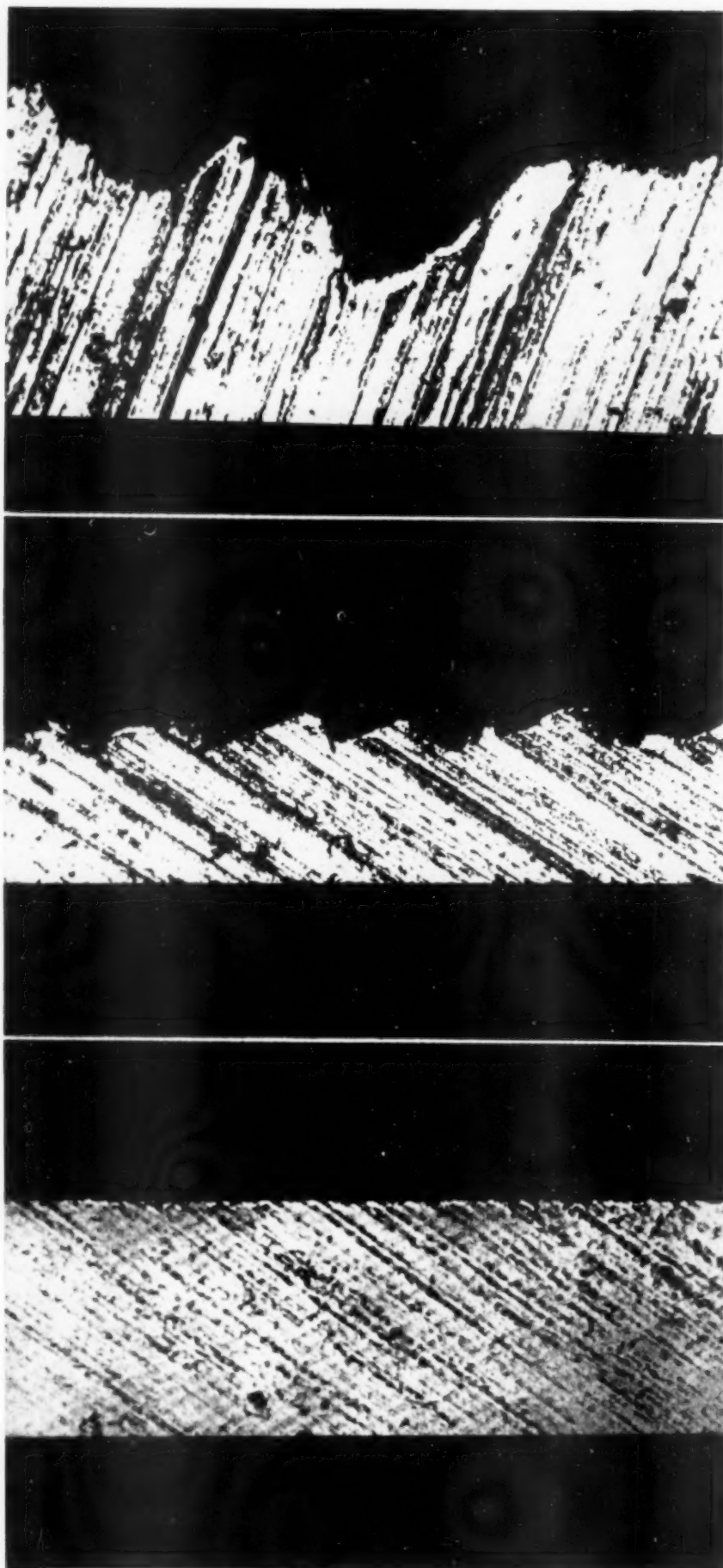
Figure 3 shows the same cutter and the same grinding wheel, but this time

it was trued or dressed with a dull diamond which still left the grinding wheel irregular—that is, a part of the grits were knocked out by the dull diamond leaving voids, that in turn left high points on the cutter tooth as shown, but this time there was a marked improvement in the performance of the cutter. It produced 60 pieces before it was necessary to re-sharpen.

In *Figure 4* we have the same cutter and the same grinding wheel but this time it was trued or dressed with a sharp diamond. A diamond set at an angle of 20° with a sharp corner and consideration was given to the



Figure 1
A Correctly designed cutter.



Figures 2 (Top), 3 (Center), and 4 (Bottom)
Showing how dressing of grinding wheel affects cutters.

grits in the wheel in relation to the traverse of the diamond across the wheel when it was dressed, and this time the cutter tooth did not have any high points. In other words, it was straight, smooth, with keen cutting edge and in this condition it produced 200 pieces.

There is one thing that has distressed me greatly. That is the great amount of "wheel burning" of cutter teeth. *Figure 5* is a thread cutter, and this cutter was used because it was easy to remove the teeth by fracture so that they could be prepared for photo micrographs.

The upper flute was ground with a wheel that slightly burned the cutting edges. The lower flute was ground with the right grinding wheel that did not burn or discolor the cutting edges. Then the teeth were removed by fracture and prepared for photographing.

Figure 6 shows the same cutter magnified $2\frac{1}{2}$ times so that you can more readily appreciate the small amount of "wheel burning".

Figure 7 shows the cutter tooth that was not "wheel burned" magnified 500 times. It is of perfect structure, 64 Rockwell C scale and it may be said that this is a 100% cutting tool.

Figure 8 shows the tooth that was "wheel burned". Note the rearrangement of the structure as compared to the previous cut. If the first cut was a 100% cutting tool, then this one could not be more than 25% because it is soft enough that it can be filed.

In other words, when the cutting edge of any tool has been "wheel burned" its value has been reduced by 75%.

You have often wondered, perhaps, exactly what takes place when a cutting tool passes through the work. In *Figures 9, 10, 11, and 12* you see actual conditions of a tool passing through a piece of 3115 steel.

Built Up Edge

In *Figure 9* you will note the small amount of build-up at the cutting edge. This is because the tool is very sharp. It is doing a good job. The chip is being ruptured from the work with very little resistance.

In *Figure 10* the cutter tooth is beginning to get dull. Note the change in the amount of plastic flow ahead of the edge of the tool as compared with the previous cut.

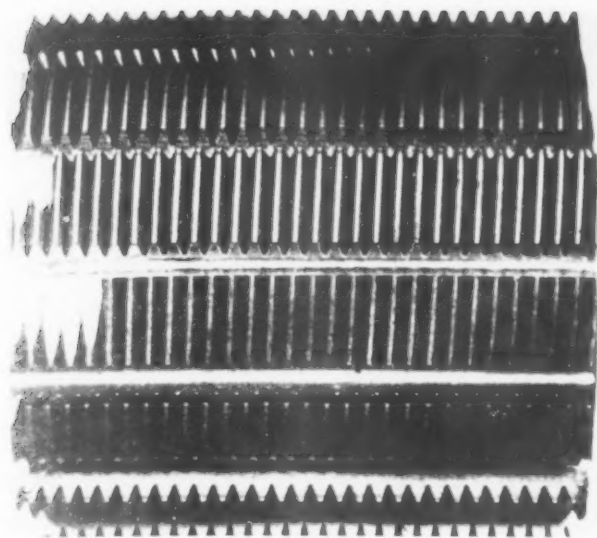


Figure 5

A thread cutter in which the upper flute was ground with a wheel which burned the cutting edges while the

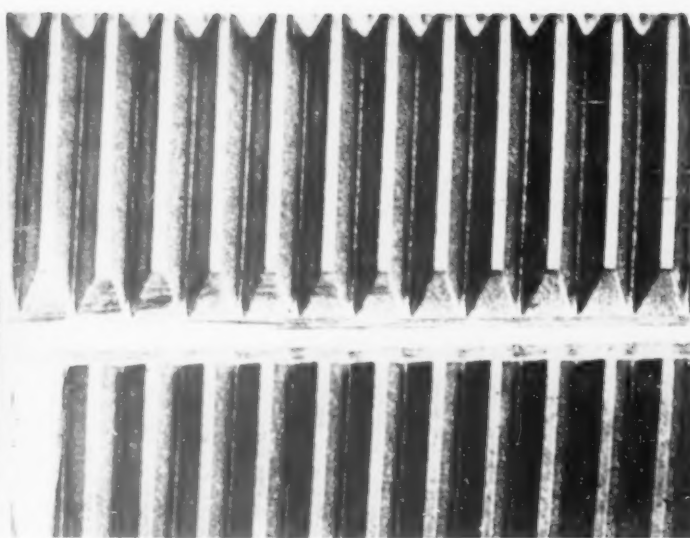


Figure 6

lower flute was ground with the right grinding wheel. The same cutter is shown at right magnified 2 1/2 times.

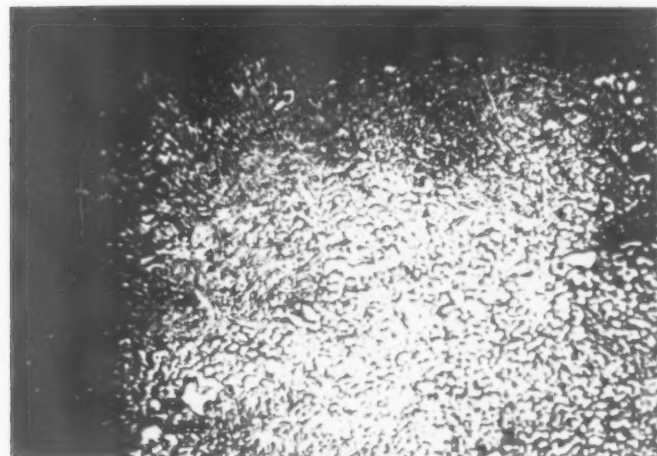


Figure 7

The cutter tooth that was not "wheel burned." It is of perfect structure, 64 Rockwell C scale and is a 100% tool.

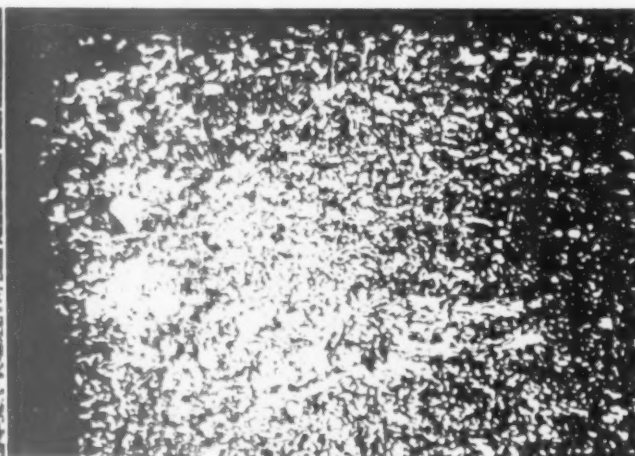


Figure 8

The cutter tooth that was wheel burned magnified 500 times. It is soft enough to be filed and structure is rearranged.

Escaping Fragments

In *Figure 11* the cutter tooth is getting quite dull. The amount of plastic flow ahead of the cutting edge is quite marked and it is beginning to leave behind it some escaping fragments where it passes over the work leaving it rough.

Figure 12 shows the tool at the point of failure. The radius has become quite large and the escaping fragments are very large with plastic flow quite marked.

In *Figure 13* design of a cutter tooth is shown which we feel will be of great interest because it represents what we think is an ideal tooth for a profile cutter. It has a small land with sufficient clearance to allow the right feed to be used on the machine. Back of the tooth is, first, a straight line,

then a curve, then a straight line and a generous radius in the flute. It has ample rake angle back of the cutting edge.

In the ideal cutter tooth, height should be about equal to the root section and there should be, of course, ample chip space provided so that there is no chance of the chips clogging in the flute. 90% of the small cutters that I have seen broken in the plant are broken because of lack of chip space in the flutes. In most instances, there are more teeth than necessary in these small cutters.

After cutters have been designed and manufactured, then they should be properly sharpened. *Figure 14* clearly shows that if the angle method of inspecting the clearance back of the cutting edge is used, a calculation will

have to be made to find the correct angle every time the diameter of the cutter is changed. In other words, on a cutter 1" in diameter, 8° of angle provides for .003 drop on a land 3/64 wide. On a 2 1/2" cutter 4° will provide the same result. On a 4" cutter 3°40' will give the same result.

I earnestly recommend that the angle method for establishing the clearance on all cutters be completely disregarded and the amount of drop in thousandths be substituted instead.

When an indicator, *Figure 15*, is used to determine the drop in thousandths in sharpening cutters, the human element of error is entirely eliminated. Therefore, it is more practical in designing cutters to indicate the desired drop in thousandths rather than using the angle method.

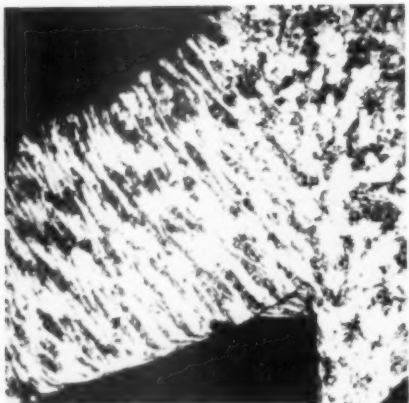


Figure 9 (Left)

A cutting tool passing through the work. Note small amount of build-up at the cutting edge. The chip is being ruptured with very little resistance.

Figure 10 (Right)

The cutter tooth is beginning to get dull. Note the change in the amount of plastic flow ahead of the tool as compared with the cut above.

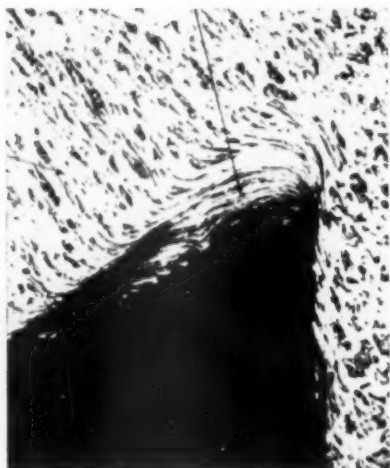


Figure 12 (Right)

The tool is at the point of failure. The radius has become large and the escaping fragments are very large with marked plastic flow.

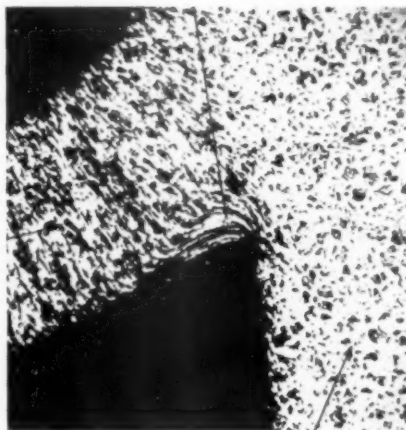
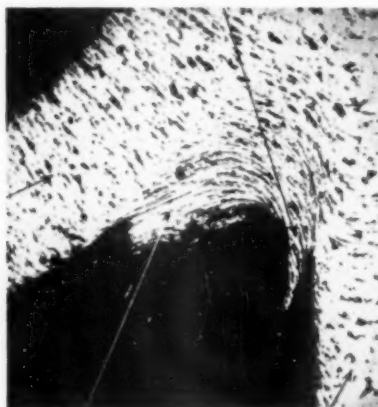


Figure 11 (Left)

The cutter tooth is getting quite dull. The amount of plastic flow ahead of the cutting edge is marked and escaping fragments are being left behind.



Indicators are now being used both in the Grinding Department and for inspection of cutters after sharpening.

Figure 16 shows a form cutter with rake angle. When cutters are made with cam relief and rake angle as shown here, then consideration is given to the rake angle when the teeth are formed. The teeth will retain their form as long as the face angle is maintained when they are sharpened. If the angle of the face or the spiral of the flute is changed, the form of the tooth will also be changed. The amount of drop back of the cutting edge on a form cutter is different than that on a profile cutter because it is a cam relief. The standard for most manufacturers for cam relief cutter is approximately .200 of drop to 1" of circular pitch.

Considering actual conditions, let us examine some drawings that will help to bring out other points than those already mentioned. We, of course, need to keep one principal objective in mind—that is, to design cutters so that the greatest possible productive capacity of the machine tool equipment can be used. During the past five or six years a great deal of experimenting has been done with two important factors—rake angle and spiral fluted cutters—that is, providing more spiral to the flute. Some of the elements that we have already discussed perhaps should be reviewed again at this point:

1. The land and clearance back of the cutting edge.
2. The form of the tooth back of the first land and rake angle on the face of the tooth.

My own experiments have proven to me, beyond a shadow of a doubt, that rake angle on the face of the tooth, if this face is properly ground, will increase the effectiveness of a cutter at least 75% on some material. The spiral flute for most cutters up to five or six years ago was about 20°. The spiral of 30° has been applied to most end mills manufactured during the past few years. This additional spiral increases the pull-out of the tool from 36% to 58%. That is not very important because holders are designed to resist this tendency to pull-out.

Rake Angle

A significant fact is that the cold cutter with 20° of spiral and no rake had maximum possible feed of 5" per

minute, and the new one with 30° of spiral and 10° of rake, had a maximum feed of 18" per minute. You will note also that the old cutter had 8 teeth and the new one only 4.

In the design of cutters it is always well to remember that rake angle has a decided influence on the usefulness of the cutter. It might be well to give a specific example—On the Side Plate of the Colt Browning Gun, using a 52° helix angle cutter. The table feed was 3" per minute. By properly sharpening this cutter the feed was raised to 7" per minute and the number of pieces per grind greatly increased. On a machine beside this one, milling the edges of the same Plate, a plain milling cutter was used and the maximum possible feed was 1" per minute. This operation has also been changed to use a cutter 52° of helix angle.

End Mills

In the following table we have some of the facts and figures showing the difference between the old and the new type of end mill.

	POWER WATTS	
	Old Design	New Design
Total Power	1300	1050
Idle Machine Power	900	900
Cutting Power	400	150

Thus for the same cut the new mill consumed 150 watts against 400 for the old. In other words, the old mill required 167 percent more power.

In *Figure 18* we have a plain milling cutter with side teeth. This cutter has rake angle on the face of the tooth and does have a place for some very light cuts. It is not desirable, however, for straddle milling or for milling deep slots such as keyways.

Half side mills should be used on all straddle milling operations because they have the advantage of angle to the flute of the cutter, providing additional shear cut. They require less power and will produce two or three times as many parts as the cutter shown in *Figure 18*.

Figure 19 is that of the staggered tooth mill and this type of mill should not be used for straddle milling. It should be used for deep slots, keyways, and other milling operations of that type. It has the advantage of shear angle, rake angle and ample chip room.

I think we all appreciate the fact that a spline mill does not cut on the sides. The only place it does

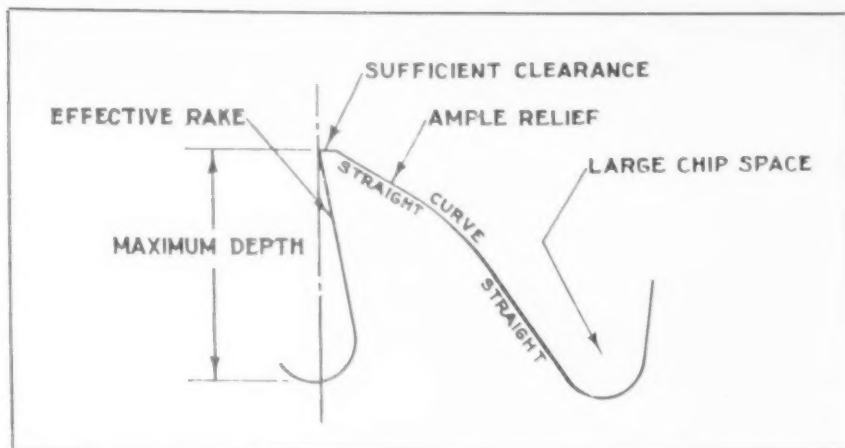


Figure 13
Proper tooth design for a profile cutter.

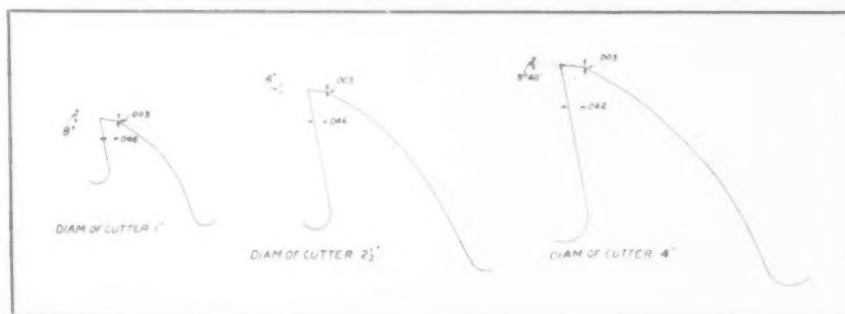


Figure 14
Angle method of inspecting clearance back of cutting edge.

cut is on the end. This should be so indicated on all drawings. In other words, the land on the side of the cutter should be cylindrical and the cutting points clearly indicated on the drawing. The cutting section is usually a chamfer or radius and should be sharpened a little beyond the depth of the cut which is usually from .005 to .015 per stroke of the spline cutter.

The straight fluted reamer with a small chamfer on the corner should be used where the hole must be reamed to the bottom or, in other words, a blind hole. It should not, however, be sharpened up to a cutting edge on the sides. It should have a small cylindrical land because it does not cut on the side. The only place it can cut or should cut is on the chamfer on the corner. Reamers for through holes should have left hand spiral and right hand cut and a lead about 1¼ to 1½ times their diameter. In other words ¼" reamer should have a lead of approximately ¾". When this type of reamer is used the chips flow out ahead of the cut and will not scratch or score the work.

A profile form cutter—that is—a cutter made to be ground by profile grinding instead of a cam re-

lief or form type of cutter must be sharpened on a machine designed for the purpose and ground to a template. The face of the tooth is radial and there is no spiral in the flute. This type of cutter may be all right for producing a few guns but surely it is not a production cutter—that is—a cutter to make a large quantity of parts. It should be replaced with a form or cam relief cutter, spiral flute and rake angle on the face of the tooth.

Cam Relief

Following is a question and answer section which may help to interpret the matters referred to in this article:

Q. What is a cam relief?

A. Cam relief is the clearance on a cutter that starts at the cutting edge of the tooth and is the shape of a cam for the full width of the tooth back of the cutting edge to provide clearance. Both standard cutters have approximately .200 cam drop to the inch of a circular pitch. When cutters are form ground, the amount of cam is reduced about one-third.

Q. What is the difference between helical cutter and spiral cutter?

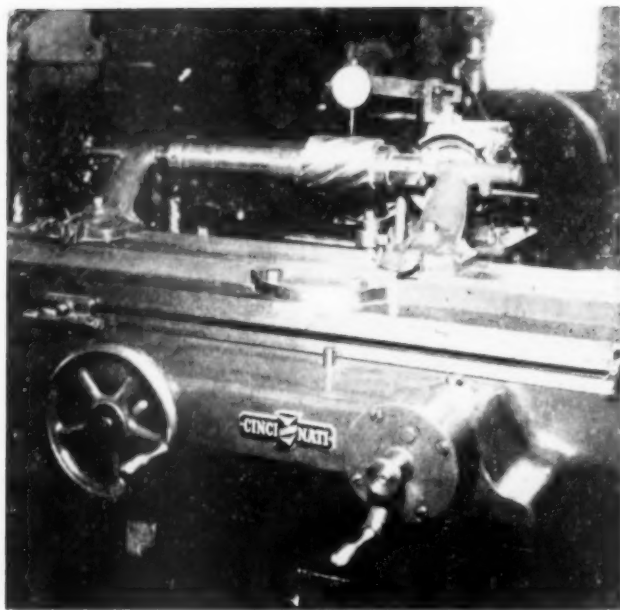


Figure 15
Indicator
method of
determining
drop in
thousandths.

A. These terms are used interchangeably in the trade. There is no difference. Helix angle or spiral runs all the way from 15° to the full helix which is 52° . This 52° was determined by Brown & Sharpe as maximum helix a great many years ago.

Q. How much land on reamers between $\frac{1}{4}$ " and $\frac{1}{2}$ " diameter?

A. This would depend somewhat on the kind of material to be reamed. On $\frac{1}{4}$ " reamer for most material, $1/64$ " of cylindrical land would probably be sufficient. On $\frac{1}{2}$ " reamer, this might be extended to as much as $1/32$ of an inch for some types of material. Reamers cut only on the forward section and not on the side. Therefore, this section should be cylindrical. They are sharpened only on the cutting end.

Q. Should cutter gangs be assembled on an arbor and left on the arbor at all times?

A. This is not entirely necessary. However, gangs of cutters should be kept together, perhaps in a box. We have had trouble in the past—several gangs of cutters that should have been kept matched or together were sent back to stores and separated so that they all had to be matched up again. This made it necessary to grind much more material off the cutters than was necessary.

Q. Is there any rule for figuring spiral on cutters in relation to diameter?

A. No particular rule except that it is not practical to have as much spiral or helix for small cutters as for larger ones. In other words, it would not be

practical to have a 52° helix for a $\frac{1}{8}$ " cutter. It would not have very much strength.

Q. Is there any point in putting spiral flute on bottoming reamers?

A. No. The advantages of left hand spiral have already been discussed. Obviously, on a bottoming reamer the chips must flow out along the flute rather than being pushed down into the bottom of the hole.

Climb Milling

Q. Do you consider climb milling better in some cases than conventional milling?

A. Yes, in most cases. Let me give you an example: Up to a few years ago the flutes of drills were milled the conventional way in two cuts—a roughing cut and a finishing cut. At that time it was necessary to change the cutter once every hour in order to provide a smooth finish. Then the equipment on which these drills were milled was changed to climb milling. These same drills it now finished in one cut using $1/3$ more feed and the cutters changed once every eight hours. And I might add that the finish is much better in one cut than it was when taking a roughing and finishing cut. About 90% of all the milling in the Union Twist Drill Company's plant is climb milling. Gangs of cutters are milled at 65 Surface Feet using 7" of feed per minute. Recently I visited a plant where a part was being milled the conventional way, using $\frac{3}{4}$ " feed. There was considerable chatter and the work was left very rough. We turned the cut-

ters around on the arbor so that we could climb mill. The feed was raised to $1\frac{1}{2}$ ", the chatter disappeared and the work came out with a perfect finish.

Q. Is interlocking by the tooth good practice or should cutters be interlocked by providing a section for the interlocking?

A. Cutters should be designed with a section for interlocking.

Q. Are there sources of information or books that would tell us the thing we have discussed?

A. We have discussed actual experiences. There are, however, two or three sources of information that may have a value. Brown & Sharpe publish a manual for milling practice; Kent's Handbook contains certain sections that give some valuable information; the Cincinnati Milling Company also publish a book entitled "Milling Practice" and there are the Mechanical Handbooks, American Machinist, Machinery, etc.

Q. Is there any advantage to staggered tooth reamers or odd number of teeth?

A. In my own experience, I have never been able to justify either stag-

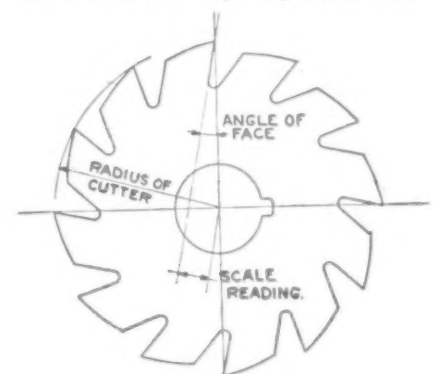


Figure 16
Form cutter with rake angle.

gered tooth reamers or odd numbers of teeth. If reamers are properly made and sharpened even numbers of teeth have worked out as well or in some cases, better than those of odd design.

Number of Teeth

Q. Is there any rule for the number of teeth for different diameters of cutters?

A. For slab mills I sometimes use this rule of thumb method of finding the number of teeth:

For Steel—two times the diameter of the cutter plus two—in other words, a 4" slab milling cutter for milling steel would have 10 teeth.

For Aluminum or Soft Alloys—the

diameter plus two—in other words, a 4" cutter for aluminum would have 6 teeth.

Clearance

Q. When climb milling does .003 drop provide enough clearance?

A. My experience indicates to me that it is not necessary to change the amount of clearance for climb milling or conventional milling for the same kind of material. One way that you can prove this for yourself is to make a layout 10 times size, cut a section of paper to represent the cutter tooth and move it in the direction that it would move if it were in the milling machine. You can readily see that ample clearance has been provided. The only difference between conventional milling and climb milling is the fact that in conventional milling, a maximum chip is formed as the tooth leaves the work and in climb milling the reverse of that is true. A maximum chip is formed at the moment the tooth enters the work.

Climb milling normally provides a smoother or straighter cut than conventional milling and it has a further advantage that more feed can be used. This type of milling however, can only be used on machine tools that are able to climb mill. When you mill the conventional way, the action of the lead screw nut is to push the cutter into the work. When you climb mill, the action of the lead screw is to prevent the cutter from climbing into the work. In other words, to hold it back instead of push it in. In order to climb mill the lead screw must be equipped with the proper lead screw nuts and means of preventing back lash.

Q. What effect does the arbor have on chatter?

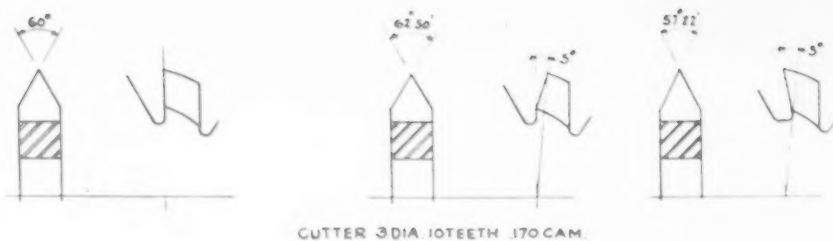
A. If the arbor is large in diameter and properly supported, the cutter properly sharpened, it will not chatter.

Q. How about back lash in the spindle? Will that cause chatter?

A. Present day equipment is so constructed that the possibility for back lash in the spindle is almost entirely eliminated. There are, however, some of the older machines in which the spindle is driven by spur gears that there is still this possibility of back lash in the spindle.

Q. Would climb milling necessarily mean a heavier fixture?

A. No, not necessarily. In climb milling, the direction of force exerted



CUTTER 3DIA 10TEETH 170CAM

Figure 17

Change in outline milled with cutters improperly ground when sharpening.

on the fixture and work is down. In some cases, such as the Side Plate on the Cold Browning Gun, the work is held by a magnetic chuck and a stop on the back of the chuck. It would not be possible to mill this same piece with this type of work holding fixture the conventional way.

Q. How should we determine arbor size?

A. Arbors should be as large as practical giving consideration to the largest possible practical arbor hole in the cutter consistent with the work to be performed. Spacing collars should be carefully examined to see they are parallel on the ends. Arbors should be equipped with full length keys. On one arbor that we examined, we found the spacing collars out of parallel as much as .020. When arbors do not run true only a part of the tooth in the cutter engages the work and the productive capacity of the machine is greatly reduced, which increases costs and retards the flow of work through the plant.

Q. What should be the Rockwell Hardness of cutters?

A. Most standard cutters manufactured today are 63 to 64 Rockwell. Some special cutters run as high as 65 Rockwell. They should not, however, except in very special cases go beyond 65 Rockwell. Cutters under 63 Rockwell have not much value today. The kinds of steel that are used make it necessary to keep the Rockwell hardness of tools rather high.

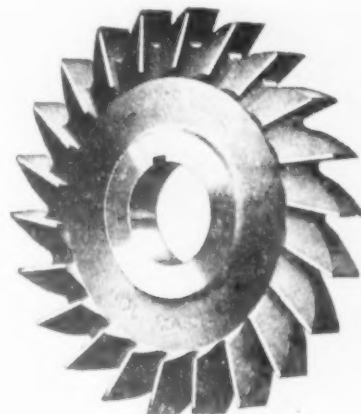


Figure 18

Plain milling cutter with side teeth.

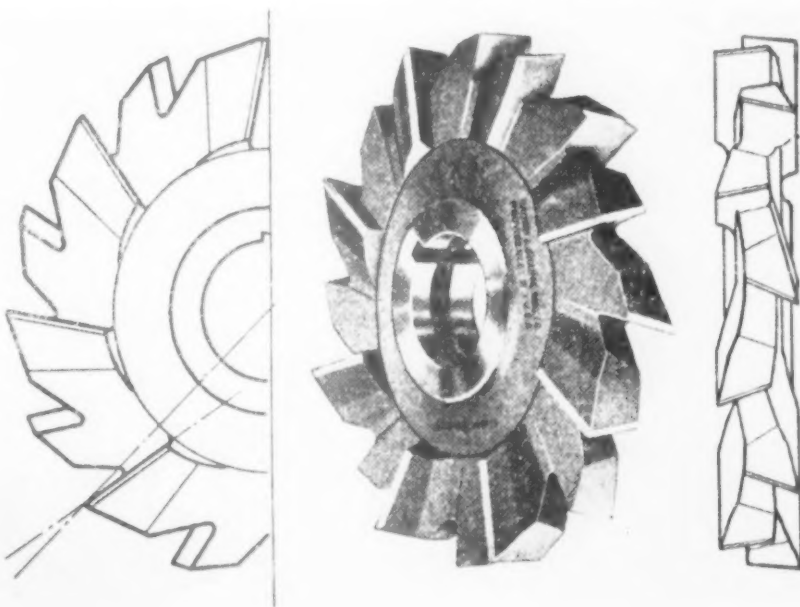


Figure 19

Staggered tooth mill.

Sub-Contracting

Written just before the Japanese attack on Pearl Harbor, this thorough analysis takes on a new importance today. Here are concrete facts concerning the way to handle Sub-Contracts presented from both the view of the Prime Contractor and the potential Sub-Contractor.

By MAJOR R. F. V. STANTON, Ord. Res.

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WITH the signing of the Armistice in 1918, the American people proceeded to abolish military armaments from their consideration. They not only beat their sword into a plow share—and in this case an automobile bumper—but melted the special anvil on which the sword was forged, and made more automobile bumpers.

The War to end War, as promised in 1918, had been won; and it was their opinion that construction of military armament was unnecessary. Attempts, during this post-war period, by far-sighted individuals, to gradually establish a new basic program of national preparedness, received scant attention and no Congressional appropriations. This attitude left armament production immobilized until 1935.

Reserve Officers of the Ordnance Department, serving voluntarily from 1924 to 1935, acting under the authority and patriotic exhortation of the National Defense Act of 1920 (a document worthy of attention at this late date) studied the probable production of special defense equipment for a future national emergency. The evident limitations of the manufacturing capacity of our existing arsenals indicated that commercial industry would be called upon to provide over 95% of the special defense materials that would be needed for any future fighting forces. About 1929, it was determined that the prin-

cipal limiting factor, as far as the calendar was concerned in any expansion program for defense material, would be the availability of the specialized machine tools, cutting tools and gages needed to produce unusual armament components, such as rifle and cannon barrels, machine gun components, cartridges, fire control devices, and countless items of naval and ordnance apparatus that were produced only in limited quantities by the Government Arsenals.

Background

During the late 20's, a few people gave heed to changes that were taking place in world affairs that produced the events at the end of the next decade. During the late 20's, our commercial production had largely centered around the production of automobiles, household appliances and refrigerators; and our machinery building industries were, in the majority, geared to the production of these types of goods. The necessity of increased manufacture of aircraft motors and new aircraft was at a minimum, due to constant new developments made in the aircraft industry, the rapid changes in models, and the relatively small amount of production that was processed through whatever equipment had been installed for this purpose. In other words, from 1929 to 1935, it might be said that aircraft engines and parts were being made in a universal type of a production pro-

gram, basically arranged to accommodate sudden changes in models, permitting flexibility at a sacrifice of volume production of any one model.

In 1935, when it became apparent to some that Germany was again on the march, foreign orders developed a new interest in armament machinery.

In 1938, with world events rapidly taking shape, there was no real stimulus given this type of machinery trade, and little was heard in this country regarding the defense machinery that would be necessary for commercial industry to produce 95% of the future national and the then-not-heard-of "lease-lend armament."

Early in 1939, the entire airplane engine, propeller and plane industries began to add new demands for specialized types of production machinery, temporarily eclipsing the smaller demands that started for strictly armament equipment. Along with this, little attention was given to the fighting techniques, which involved increased rates and strength of firing power and the production problem involved in providing special cartridge-making machinery, needed to match these new firing rates. Added to this, was the extension of military automotive transportation, the entire tank development. Then followed a deluge of foreign commission orders, with the start of the war in 1939. Beginning in July 1940, the machinery building industries of the United

States faced a complete and overwhelming reversal in their production problems. The expansion and creation of new plants, authorized within such a short period, created a demand for standard machine tools and specialized machine tools that was beyond any predicted demand. This, in turn, created another demand for machine tool supplies, which again created an additional demand for more machine tools to produce those supplies. At any turn in the program, there was a machine tool or specialized machine demanded to start some program.

The sudden induction of many new hands into the industry created the necessity of providing unskilled men with new machine tools, that would provide accuracy and skill, which they would ordinarily have to spend years to acquire.

While Tool Engineers know the answer, it is still difficult to explain that this equipment (of which so much is needed) must come out of the foundry, steel mill and forge shop; be processed through to machine shop, tool room; and receive the expert touch of a few experienced assemblers, to make the equipment function properly before any armament production can start—all of which takes an agonizing amount of time in an emergency.

As soon as the military departments began to contract some of this 95% of the armament demand, it revealed another situation in machinery requirements. A specific example of this was found in an investigation made with one of the Hartford typewriter factories. They were asked to consider adapting their manufacturing facilities to the production of 45 caliber automatic pistols, in event of a national emergency. This company was a large and very active corporation in the typewriter field. In the early manufacturing history of this country, typewriters and guns were produced by closely parallel methods, sometimes within the same company buildings. To approach this industry seemed quite logical. On detailed investigation, it was found that during the past 20 years, that the design of the typewriter had been so changed that most of the machining operations, formerly found in typewriter construction, had been eliminated. Typewriters were being produced predominantly by Punch Press opera-

tions and on Die Casting Machines. The former large milling departments and extensive profiling and drilling departments had been reduced to an unappreciated small size. But in the 45 caliber automatic pistol, there were as many milling and profiling operations as there were 30 years ago. The design of Ordnance Material, from the standpoint of manufacture, had not changed, and could not be changed, due to the difference between weapons and retail articles. This idea had to be abandoned. If this company had accepted any part of this pistol, beyond a few of the round parts that could be made in an Automatic Screw Machine, it would have been involved in a most extensive program of ordering new machine tools. This example can be traced through the entire Defense Program; and is an example of one of the answers why it takes so many weeks to tool up to produce armament material. Some questions may be asked why Germany could start and continue a war of this magnitude with their supposed restrictions from the Versailles Treaty, unfavorable raw material supply and bankrupt financial conditions.

German Developments

During the post World War period, principally from 1923 to 1933, the Germans did not indicate openly that they held a secret desire to again fight the British and French. Before taking any military steps, the Germans, in 1923, adopted a series of industrial standardizations for their industries, their machinery, machine tool products, and everything else of a basic nature, so that there would be real interchangeability — an economic and

military advantage in their commercial industries. They created a new machine tool industry of their own. They allowed their commercial machinery producing firms to take all the Russian and other foreign business that they could handle. The German government, for a good many years, guaranteed 66% of any Russian or foreign contract price to the German manufacturer, in event that financial assistance was restricting their expansion. The Germans did not talk about high-speed airplanes, but did a tremendous development work with Diesel Engines and other fuel injection methods that might solve their basic transportation fuel problems and resist a probable blockade. They did not talk about tanks as such, but developed elaborate machines for generating bevel gears, which have later shown up in producing some of their tank drives. They developed tungsten carbide for quicker production of heavy armature shafts in their electrical industry; but did not say anything about the possibilities of turning shell blanks at a higher rate of speed. They did no visible work on any machine guns or anti-aircraft cannon; but their development engineers left Germany, hired out at low salaries in the foreign armament works. With their technical knowledge and positions, they influenced placing of tooling and machine equipment business from these armament firms into Germany, offering cheaper labor and engineering services as an advantage. This method extended the basic armament industrial system in Germany into widespread commercial enterprise. They captured every arsenal equipment order, except one,

Torpedo Bulkhead on Lathe at Alexandria Torpedo Station
Production has speeded up to 24 hours a day.



in world trade for over ten years. They practically gave their production away in some cases, so that they could work on export orders to obtain strategic material that they wanted, and increase their own facilities under the guise of commercial enterprise



Major Stanton
The calendar counts most.

to circumvent treaty provisions. They trained apprentices from 1926 on, and developed a wide-spread Technical High School System for production engineering. They sent many of their graduates into this country, and then called them home when needed. While their army was held to 100,000 by the treaty; under the guise of export business, they developed an industrial army of over 3,000,000 mechanics, who were well trained with plenty of practical experience, before throwing their skill into the dream of conquest. These are detailed examples of 7 to 12 years' work abroad, that American Industry is asked to telescope into less than two years.

The impact of the strictly-arms program in July 1940, added almost a two-years' equivalent of machinery business to the existing backlogs. No government edict was necessary to start contracting these orders. In fact, most of this business was into contract manufacture before sub-contract bulletins and exhortations were emphasized by Washington authorities.

In deciding to seek assistance of other concerns, by having parts or machines made under contract, it was necessary to formulate certain policies. Briefly, these are outlined:

1. If the calendar cannot be saved, there was no use to attempt contracting.

2. Contracting should be done within a reasonable distance of the home plant, and not invade an area where other groups of the industry might operate.
3. Contracting should be established as a separate operation, and not mixed too deeply with home plant production.
4. Existing and necessary standards of accuracy should be maintained by a Resident Engineer and Inspector, located in the contractor's plant.
5. The home plant should furnish contractors all rough materials and finished materials, unless the contractor has a foundry, forge shop or steel supply.
6. Finished product should be accepted in the contractor's plant by Resident Inspectors; but returned to the home plant for re-check on field inspection, and corrected, if necessary, before shipping to customer.
7. Contractors should be selected, asked for a quotation and a manufacturing plan, and given the order if submitting a favorable proposal. No competitive bids should be asked from another potential contractor.
8. Every inquiry should be firm; and an order definitely in back of each inquiry.
9. Product selected for contracting should be of the special armament machinery class, if possible, so that this important type of product could be spread into as many producers as possible.
10. Home plant tooling should be duplicated, if needed; special operations should be done by the home plant on a service basis; workmen from contractor should be brought to the home plant for periodic instructions.
11. All fears regarding the future should be discarded, such as possibilities of developing a future group of competitors; having designs pirated or home organization disrupted by additional sources of employment.
12. Emphasis should be placed on the facts that the contract must be mutually profitable financially; that the delivery schedule should be prompt and zealously executed; and that proper standards of quality should be maintained.
13. There should be no "fine print" in the contract; none in the quotation.
14. These contracts should be a means of making friends for the parent company for the future, when special products are not needed, and industry returns to its normal commercial pursuits.
15. Priority regulations should be scrupulously observed; there should be no premiums, inducements or commissions paid to place work into other plants.
16. It should be recognized that during this emergency, all people have their own troubles; that in entering this type of activity, there is equally as large a selling task to engage a satisfactory contractor as there is a purchasing task.

Basic Considerations

During preliminary discussions with potential contractors, there are some ten basic considerations necessary. These must be settled while negotiations are on paper and far in advance of metal cutting. If time or facility do not permit the negotiators to settle these questions, these items will have to be answered in the future, even by the workmen or some unauthorized party. Wherever these fundamentals are dismissed without considerations, they will re-occur in metal, cause a loss of calendar, say nothing of money and material. Some of these considerations must be outlined by the parent company, after which the potential contractor must submit answers in his manufacturing plan and quotation. While all this applies to defense machinery contracting, the underlying principles can be analyzed and applied to any type of production activity.

Data Supplied

The data offered by the parent company must adequately describe:

1. The Product
 2. The Quantities
 3. The Materials
 4. The Accuracy
 5. The Disposition
- The answers from the potential contractor must show:
6. The Personnel available and required.
 7. The equipment for manufacturing, available and required.

(Continued on page 126)

Tool Engineering DATA SHEET

MILLING CUTTERS FOR DURAL—II

By A. C. Siegel, General Foreman, Airplane Division, Curtiss-Wright Corp.

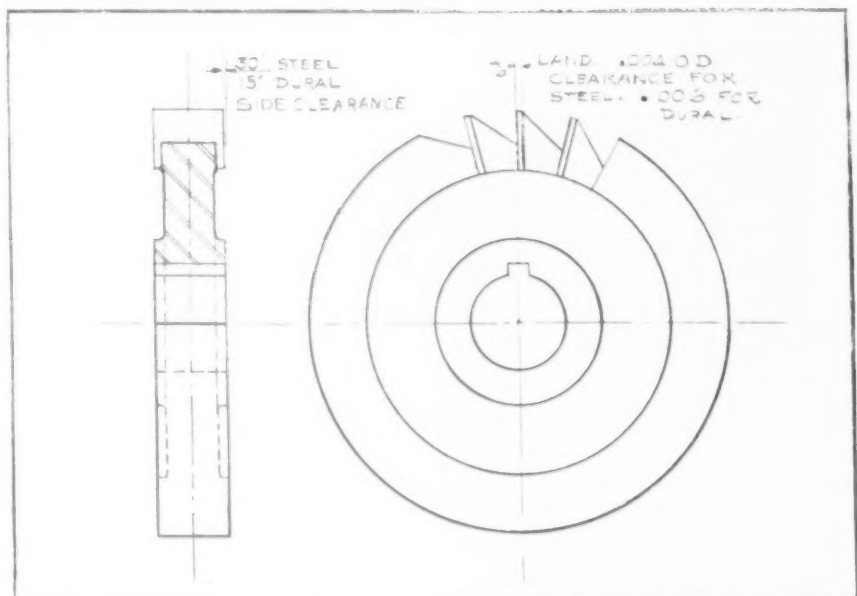
(Second of Two Parts)

For end milling we are using Thurston two lip cutters. Speeds and feeds depend on side of cutter, of depth, and accuracy of cut.

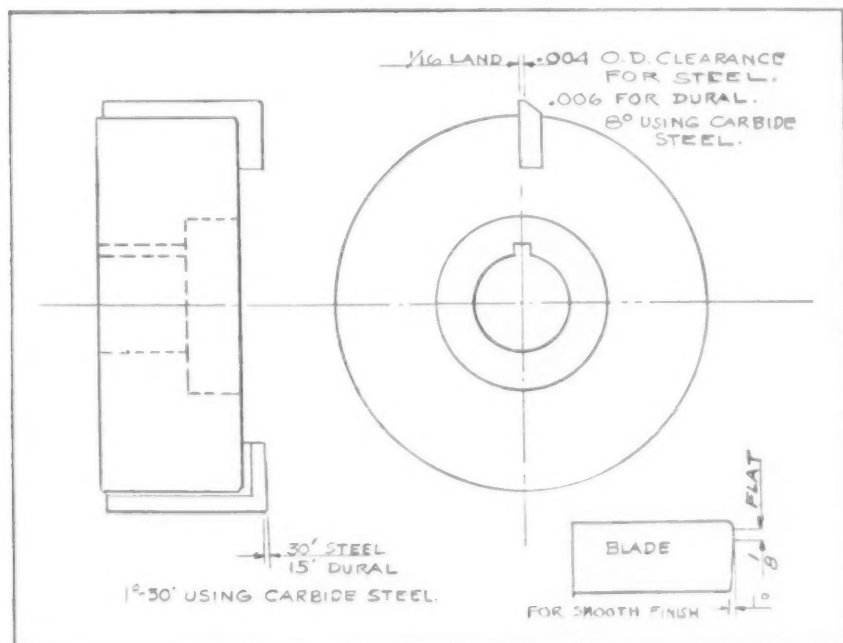
Slab milling cutters we get with teeth spaced approximately 1" on periphery with a 45° helix angle. Run from 700 to 1000 R.P.M. with 10" to 15" feed, dependent on amount of stock to be removed and accuracy required.

Slotting and side mill cutters have the teeth spaced from 1½" to 2" on periphery, dependent of the dia. of the cutter. Speeds and feeds for this type of work vary from 350 to 1000 R.P.M. with feeds from 2" to 10".

With the teeth spaced as far apart as mentioned, and run at high speeds and fast feeds, the results gained are: smooth finished, heat generated into chip instead of work, and greater production.



Above
Side Mill Cutter



Left
Face Mill Cutter

Hook angles should be from 10° to 15° with 20° to 25° helix angle on face and side mill cutters.

To grind face mill cutters the head should be tilted down 4° and the table turned ¼°. The land left should be from .101" to .060".

Experience with tapping mushy, dural castings or lynite had led us to much grief, with torn threads, poor spot-face finishes, etc. until we discovered and now use Sulfo Product No. 1550. This mixed with Ker-sol to a consistency of cream, will produce a good clean thread. On dural or lynite it tends to keep the tap cutting to size but on steel it will cut oversize.

NOTE: This is the third of a series of Data Sheets which will be published in THE TOOL ENGINEER hereafter. A handy three ring binder can be secured at any book, stationery, or dime store and will hold the sheets for convenient and frequent reference.

Proposed College Course in Tool Engineering

By **HERBERT D. HALL**

Chairman, A.S.T.E. Committee on Education

THE course in Tool Engineering offered below is the work of the Committee on Education and Training of the American Society of Tool Engineers. The basic groundwork for the course was first suggested by Otto W. Winter, first vice-president of the A.S.T.E. and a member of the committee. Revisions were made by the Educational Program Advisory Committee, a local group also headed by Mr. Hall, which met in Newark, N. J. Although it is doubtful that any two people could agree on all the details of a complex subject of this nature, the majority of the national Committee on Education and Training have approved the accompanying report and have authorized its publication. The committee includes Herbert D. Hall, Chairman, Otto W. Winter, James R. Weaver, Roy E. Bender, Roy E. Ellis, Frank J. Oliver.

Because of the fact that the chief demand of the defense program has been production and has entailed the "tooling up" of vast new industries for the manufacture of tanks, guns and ships, engineering colleges throughout the country have been offering short term courses (the average is 20 weeks) in tool and die design, production planning and control, and so-called "Tool Engineering." These courses are being supported by Federal funds and are often taught nights by men drawn from local industries. It goes without argument that a real course in Tool Engineering can not be taught in 20 weeks. Yet the very fact

that many colleges are now offering Tool Engineering subjects in emergency training courses has obliged engineering college administrators to recognize the fact that such a field of engineering exists.

Full Four-Year Course

And because the necessities of the times have made educators so conscious, the Committee on Education and Training of the American Society of Tool Engineers believes that now is an opportune time to come forward with a proposal for a full four-year course in Tool Engineering that would be worthy of adoption by any college in the country now offering accredited courses in mechanical engineering or industrial engineering. The moment is not inopportune merely because the emphasis today is on short term programs; after all, there has been no thought of reducing the normal training procedures for educating the youth of America for ultimate jobs in industry.

The Committee makes bold to offer this proposed course to engineering educators despite the fact that there has been a pronounced trend in recent years in many colleges away from specialized courses and toward broader fundamentals and more of the "humanities." Examination of the proposed course will show that it contains about the same weight of engineering fundamentals — chemistry, physics, mechanics and mathematics — as found in any course in mechan-

ical engineering, although it does not go beyond the calculus in mathematics, since the practicing Tool Engineer is seldom called upon to use even this analytical tool. As to the humanities, there just is no room in a course of this kind to wander off into interesting cultural sidelines since the weekly hourly load is probably as great as found in any engineering college in the United States today. That part of the Tool Engineer's education will have to be left to wide and serious reading after he leaves college. Several suggested reading lists have already been suggested along these lines by the Engineers Council for Professional Development.

Engineering Content

The Committee had already been warned by a number of college deans that any proposed course in Tool Engineering, to be acceptable to accredited colleges, must have "engineering content." By this is meant that the professional subjects must be something more than memory courses involving names of machines, tools and methods; it must be capable of analysis, correlation, mathematical computation and judgment. The Committee believes that the subjects they have listed in detail will meet this test. It will be noted particularly that a logical system of prerequisites has been built up and that practical applications have been closely correlated with theory presented in earlier courses. The net result should be the develop-

ment of an engineer who is able to envision the entire problem of manufacturing in metals, which is primarily what the Tool Engineer is concerned with. At the same time, it is realized that the embryo Tool Engineer will have to occupy only a minor role in

the industrial scene during his early years out of college, and therefore upon graduation he should be trained in college so as to be of immediate value in the tool design department or in the production divisions of the manufacturing establishment

The educator might well ask just what is a Tool Engineer and what are his functions. One simple definition is that a Tool Engineer is one who is capable of conceiving, designing and planning the complete installation of a tool or set of tools that will perform

PROPOSED COLLEGE COURSE IN TOOL ENGINEERING Planned for a College operating on the three-quarter basis.

FRESHMAN YEAR

Subject	FRESHMAN YEAR		HOURS PER WEEK		
	Credit Hrs.	Lecture & Recitation	Lab & Lecture	Total in School	Preparation
1st year—1st quarter					
Chemistry—General	4	3	4	7	5
College Algebra	5	5	—	5	10
English	4	3	—	3	6
Hygiene & Personal Living	1	1	—	1	2
Survey of and Introduction to Engr.	1	1	—	1	2
Engineering Drawing	4	1	8	9	2
Physical Education	1	—	2	2	—
Military Science	1	1	—	1	—
Total	21	15	11	29	27
2nd quarter					
Elementary Surveying	3	2	1	3	—
Chemistry—General (cont'd)	4	3	4	7	5
Plane Trigonometry	5	5	—	5	10
English	3	3	—	3	6
Engineering Drawing	4	1	8	9	2
Physical Education	1	—	2	2	—
Military Science	1	1	—	1	—
Survey & Introduction to Engr.	1	1	—	1	2
Total	19	16	15	31	25
3rd quarter					
Chemistry—Qualitative analysis	4	2	6	8	5
Analytic Geometry	5	5	—	5	10
Descriptive Geometry	4	—	8	8	—
English	3	3	—	3	6
Engineering Dwg.	2	1	3	4	2
Physical Education	1	—	2	2	—
Military Science	1	1	—	1	—
Total	20	12	19	31	23
Summer Practical Experience	5				

The first year is devoted purely to engineering "fundamentals" and serves as a background for any course in engineering—mechanical, electrical, etc.

SOPHOMORE YEAR

Subject	Credit Hrs.	HOURS PER WEEK			Preparation
		Lecture & Recitation	Lab & Lecture	Total in School	
2nd year—1st quarter					
Outline of Industrial Eng...	3	3	—	3	6
Calculus	5	5	—	5	10
Physics—Mechanics	5	4	2	6	8
Engineering Drawing	3	1	6	7	2
Military Science	1	1	—	1	—
Materials of Engineering ..	3	3	2	3	6
Total	20	17	10	28	32
2nd quarter					
Calculus	5	5	—	5	10
Physics—Heat, Light, Sound	5	4	2	6	8
Elem. Machine Drawing	3	1	6	7	2
Military Science	1	1	—	1	—
*Foundry Practice & Pattern Making	3	—	6	6	2
*Principles of Metal- lography	3	2	4	6	4
Total	20	13	18	31	26
3rd quarter					
Accounting—General	5	5	—	5	10
Calculus	5	5	—	5	10
Physics—Elec. & Magnetism	5	4	2	6	8
*Metallography of Iron & Steel	4	2	6	8	4
Military Science	1	1	—	1	1
*Elem. Machine Shop Practice	3	—	6	6	2
Total	21	17	14	31	41
Summer Practical					
Experience	5				

*Courses which are prerequisites to more advanced courses along Tool Engineering lines. An analysis of these special courses, most of which are electives in many engineering colleges today, follows the tabular presentation of course titles, credit hours, etc. Other subjects continue the standard engineering fundamentals.

JUNIOR YEAR

Subject	Credit Hrs.	JUNIOR YEAR			HOURS PER WEEK		Preparation
		Lecture & Recitation	Lab & Lecture	Total in School			
3rd year—1st quarter							
Mechanics—Statics	5	5	—	5	10		
Economics I	3	3	—	3	6		
Adv. Mach. Shop Practice	3	—	6	6	2		
Elements of Time & Motion Study	3	3	—	3	6		
Time & Motion Study Practice	3	1	5	6	1		
Metallography of Spec. Alloy Steels	3	2	3	5	4		
Total	20	14	14	28	29		
2nd quarter							
Production control	3	3	—	3	6		
Mechanics—Dynamics	3	3	—	3	6		
Economics II	3	3	—	3	6		
Cost Accounting	5	5	—	5	10		
Tool & Die Making	2	—	6	6	2		
Heat Treating Equipment and Controls	3	—	6	6	2		
Total	19	14	12	26	32		
3rd quarter							
Mechanics—Str. of Material	5	4	2	6	9		
Machine Design	5	4	3	7	8		
Machine Shop Operations & Equipment	3	3	—	3	6		
Plastic Molding & Extrusion	3	3	—	3	6		
Cutting Tool Design	3	2	3	5	6		
Inspection Trip	2	—	—	—	—		
Total	21	16	8	24	36		
Summer Practical Experience	5	—	—	—	—		

Except for "mechanics" and machine design, the courses given in the Junior Year are directly related to Tool Engineering.

SENIOR YEAR

Subject	Credit Hrs.	HOURS PER WEEK			Prepara- tion
		Lecture & Recitation	Lab & Lecture	Total in School	
4th year—1st quarter					
Elect. Engineering D.C.	4	3	3	6	6
*Mach. Tool Design	2	2	—	2	4
*Inspection & Gaging	2	2	—	2	4
Jig & Fixture Design I	2	—	6	6	2
*Metal Forming	2	2	—	2	4
Hydraulics & Pneumatics (Applied)	3	3	—	3	6
Welding & Welded Struct.	3	3	6	9	6
Total	18	15	15	30	32
*These subjects to be taught in combination with motion pictures.					
2nd quarter					
Elect. Engineering A.C.	4	3	3	6	6
Jig & Fixture Design II	5	—	15	15	4
Finishing Methods	2	2	—	2	4
Material Handling Equip. & Methods	2	1	3	4	2
The Industrial Plant	2	1	3	4	2
Applied Electricity & Elec- tronics to machine control	3	1	6	7	2
Total	18	8	30	38	20
3rd quarter					
Adv. English for Engineers ..	3	3	—	3	6
Equip. Selection & Invest.	2	2	—	2	4
Sheet Metal Working & Die Design	7	3	12	15	8
Cost & Production Estimating	2	2	—	2	4
Maintenance & Millwrighting	1	1	—	1	2
Tool Engineering Thesis	4	—	12	12	3
Total	19	11	24	35	28

With the exception of the short courses in electrical engineering, and in advanced English, the courses listed above are special to Tool Engineering

any desired operation or series of operations required for the fabrication of metal products or their substitutes. Tool Engineering involves the general problem of engineering a product for production, determining the sequence of operations, lining up the equipment necessary to make it, designing the tools, setting up a system of gages, buying the machine tools and other productive equipment and buying or making the small tools, cutters, gages, jigs, fixtures and special tools used in the actual manufacture of the product.

New Materials

Most Tool Engineers in industry today reached their present positions the hard way. Many of the most capable ones are apprentice graduates, who first made good as tool makers, then became tool designers and Tool Engineers. Those who are college trained had taken courses in mechanical engineering (and learned a lot about power plant engineering, which they promptly forgot) or in industrial engineering. While in college, few of them heard anything about jigs and fixtures or argued with virtues of climb versus conventional milling or studied the effect on tool life of adding sulphur to cutting oils. But in recent years, the problems of working the many new materials have become so complex, and the wide adoption of mass production methods has brought in not only engineering problems relating to selection of equipment and tooling but also the vital economic factors relating to tooling cost, that scientific organization of knowledge of all phases of the subject is necessary if the time of learning is to be kept to a reasonable limit. The logical solution is the college course.

At the same time it is recognized that nothing can take the place of practical experience, and since the course in Tool Engineering is predicated on a thorough knowledge of shop practice, it is urged that students contemplating such a course should not only work summers in the shop, but could well afford a year in the shop between high school and college.

It will be noted that the proposed course in Tool Engineering is based on a college operating on the "quarter" plan, whereby the quarters are spent consecutively on the campus and the fourth quarter is the vacation

period—really a summer work period. Colleges operating on the two-semester basis would have to make some revisions, obviously, if they were to adopt the plan. The main thought of the Committee, however, is to outline in detail all the courses which they believe essential to the education of a Tool Engineer or production executive. It is realized that the exact interpretation of the plan will vary from college to college, largely depending on courses already available, teaching load, and other matters of individual choice. In order to show the relative weight of the courses, however, it was necessary in this outline to show a detailed breakdown of credit hours, classroom and laboratory time and outside study time, the last of which is probably on the high side.

A major revision of the courses would be necessary for a college operating on the five-year cooperative plan. Much if not all of the shop could be eliminated in college.

1st Quarter—2nd Year

OUTLINE OF INDUSTRIAL ENGINEERING. The development and nature of industrial engineering and Tool Engineering, of mass production, types of organizations, advantages and disadvantages, etc. General plant operation and enterprise structure.

MATERIALS OF ENGINEERING. This course covers a general description of the materials both ferrous and non-ferrous and non-metallic used for industrial construction, their origin, refinement, structure, characteristics and use.

2nd Quarter—2nd Year

FOUNDRY PRACTICE. A combination lecture and laboratory course covering bench, floor and machine molding, cupola operation and core making, foundry tools and appliances, foundry materials, methods, costs, etc., metal mixing for gray iron, brass, bronze and aluminum. Also modern methods of pattern making and pattern construction, design and storage.

PRINCIPLES OF METALLOGRAPHY. An elementary course in physical metallurgy. Study of structures and equilibrium relations of metals and alloys by use of the microscope. Crystalline structure and physical properties of metals and alloys and changes produced therein by temperature. Problems on the quantity

and distribution of structural features. Construction and significance of equilibrium diagrams. In the laboratory, metals and alloys are melted and cast and specimens are prepared for microscopic examination to correlate structure with composition and treatment.

3rd Quarter—2nd Year

ACCOUNTING—GENERAL. A general survey of the principles of accounting and their application in modern business. Points emphasized are: use of accounting for information and control; the double-entry theory and the mechanics of book-keeping; account classification; determination of profits; problems of valuation; presentation and analysis of financial and operating statements. The course is intended for students whose major interest is in fields other than accounting.

METALLOGRAPHY OF IRON AND STEEL. Physical metallurgy applied to iron-carbon alloys, steels and cast iron. Continuation of Metallurgy 606 with specific reference to iron-carbon alloys. Iron and steel terminology and conventional methods of heat treatment are studied from the standpoint of equilibrium and structure changes. Laboratory work in the development of the technique of taking photomicrographs of carbon steels in annealed and heat treated condition.

ELEMENTARY MACHINE SHOP PRACTICE. Lecture and laboratory practice on bench work and lathe, shaper and drill press operations.

1st Quarter—3rd Year

ADVANCED MACHINE SHOP PRACTICE. More advanced work on lathes, planer, shaper, plain and universal milling machines, grinders, turret lathes and drill presses. Work organized and carried out on a production basis of standard times, interchangeable parts, tolerance limits, inspection and assembly.

TIME AND MOTION STUDY. Principal aims and applications of time and motion study, job analysis, standardization, formula construction, job and wage evaluation.

TIME STUDY PRACTICE. Laboratory application and practice of the subject matter given in the above course to a degree which enables the student to function as a time and motion study man in industry. This

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SERVICE MEN**
for Personal
Demonstration

**OPERATOR
TRAINING**
Through
PICTURES - TEXT BOOKS
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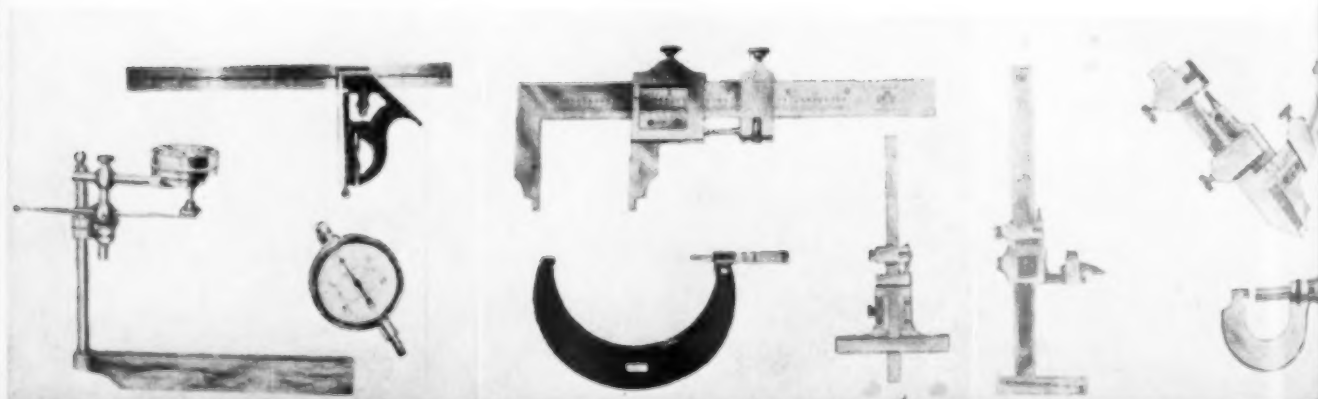
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course must be taken concurrently with the above.

METALLOGRAPHY OF SPECIAL ALLOY STEELS. An introduction into the general subject of alloy steels. Lectures on effects of alloying other than carbon in steels. Special treatments, such as case carburizing and nitriding and the metallographic and structural features and equilibrium relationships involved. Laboratory work in measuring critical and transformation temperatures, practical carburizing and heat treatment to secure specified structures and physical properties.

2nd Quarter—3rd Year

PRODUCTION CONTROL. A practical lecture course covering production control systems, work routing, dispatching, time keeping, inventory control, stores, etc.

COST ACCOUNTING. This course is intended primarily for students whose major interest is in fields other than accounting. Emphasis is placed upon the accumulation of material, labor and expense, cost of production and distribution and to the relationship between cost accounting work and that of other business departments.

TOOL AND DIE MAKING. A combined lecture-laboratory course covering modern tool and die making methods, tool and die shop technique and equipment. Principal objective to develop knowledge not necessarily skill.

EQUIPMENT AND CONTROLS

HEAT TREATING. A general lecture and laboratory course covering fundamental principles and practice. Types of heat treating furnaces, fuels, pyrometers and other control instruments; quenching media; conveyor systems and mechanical handling.

3rd Quarter—3rd Year

MACHINE DESIGN. Elements of machines, plain, ball and roller bearings, shafts, gears, chain and belt drives; fastening devices; calculations of loads and stresses; practical application of mechanics and strength of materials.

MACHINE SHOP OPERATIONS & EQUIPMENT. A lecture course in the practical application of machine tools and supplementary equipment, utilizing motion pictures, slides, catalogs and technical journals, and where possible — inspection trips.

(Purpose to supplement work done on machines in college shop.)

PLASTIC MOLDING AND EXTRUSION. Study of plastics, methods of setting, equipment; die design and die manufacture die hobbing; economic factors.

CUTTING TOOL DESIGN. A combined lecture and drafting room course coupled with shop tests on various designs of cutting tools. Stress laid on the importance of cutting angles, strength, accuracy, cutting tool materials—their heat-treatment, etc.

1st Quarter—4th Year

MACHINE TOOL DESIGN. A lecture and recitation course on the design of modern machine tools utilizing previous courses taken in mechanics, strength of materials, engineering drawing, machine design, etc.

INSPECTION PROCEDURE AND GAGING EQUIPMENT. Inspection methods and systems. Principles of interchangeable manufacturing, systems of fits, limits and tolerances, design and application of inspection and gaging equipment.

JIG AND FIXTURE DESIGN I AND II. A combined lecture-drafting room course utilizing practical examples from industry—sample jigs and fixtures borrowed, etc.

METAL FORMING. A lecture course covering the design and application of equipment for and the nature and application of the following processes—flat die forging, drop forging, hot and cold heading and upsetting, coining, swaging, hot and cold rolling, wire drawing, extruding, etc.

HYDRAULICS AND PNEUMATICS (APPLIED). Practical application of hydraulic and pneumatic circuits to machine tool controls; fixed and variable speed pumps and hydraulic motors; pistons, valves and electric solenoid control; press applications; compressed air tools, chucks and clamps; air compressors, etc.

WELDING AND WELDED STRUCTURES. This course deals with resistance, arc and oxy-acetylene welding. A combined lecture-drafting room and laboratory course, involving welding technique, equipment, welding design and application. Also gas cutting techniques.

2nd Quarter—4th Year

FINISHING PROCESSES AND METHODS. A lecture course on modern polishing, plating, painting,

cleaning, pickling, sand blasting and corrosion-prevention methods, and equipment, etc.

MATERIAL HANDLING. A combined lecture and laboratory course on modern material handling methods, systems, equipment and control. Laboratory work covers layout of material handling systems for specific problems.

THE INDUSTRIAL PLANT. Plant location, construction, layout, lighting, heating, ventilation, power supply, distribution, and maintenance, etc.

APPLIED ELECTRICITY & ELECTRONICS. Motors and control applied to machine tool drives; sequencing controls and electrical interlocks; study of specific machine tool electrification problems; electronic devices applied to production machinery.

3rd Quarter—4th Year

ADVANCED ENGLISH FOR ENGINEERS. Training in English for practical and professional writing. Emphasis is put upon the business letter and the general engineering report.

EQUIPMENT SELECTION AND INVESTMENT. The practical economy of the selection of various types of equipment and the establishment and presentation of an investment analysis.

SHEET METAL WORKING AND DIE DESIGN. A lecture course covering rolling mill practice and materials, punching and blanking dies and presses; forming, drawing and embossing dies and presses, shearing, bending, beading, rolling, slitting and spinning, riveting, etc.; laboratory course in sheet metal and forging die design, utilizing practical examples borrowed from industry.

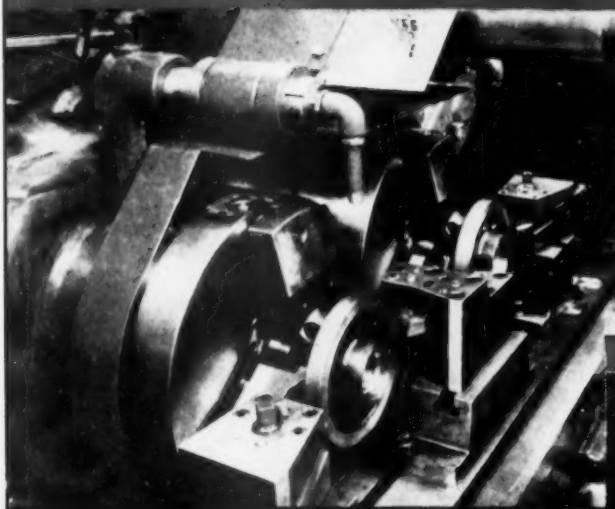
COST AND PRODUCTION ESTIMATING. A course in the development of estimating technique for tool and equipment costs, production rates, cost ratios, establishment of basic time charts, etc.

MAINTENANCE AND MILL-WRIGHTING. A general course in maintenance systems, methods, control, organization and equipment.

TOOL ENGINEERING THESIS. Complete tooling of a product including selection of equipment and design of fixtures, selection of cutting tools, speeds and feeds, operating time, cost estimates, etc.

2 SPINDLE OUTPUT FROM SINGLE SPINDLE FLOOR SPACE

17.8 Gear Blanks Machined per Hour



5-D

2-SPINDLE

12" POWERFLEX

PRODUCTION DETAILS . . .

Part: Tractor Steering Clutch Driving Gear

Material: Steel Drop Forging — SAE 3115

Machine: 5-D Two Spindle Powerflex

Operations:

1st T.F.: Core drill hole (hole pierced)

2nd T.F.: Rough bore hole; rough face one end of hub; rough turn O.D. of gear; rough face both sides of gear at rim.

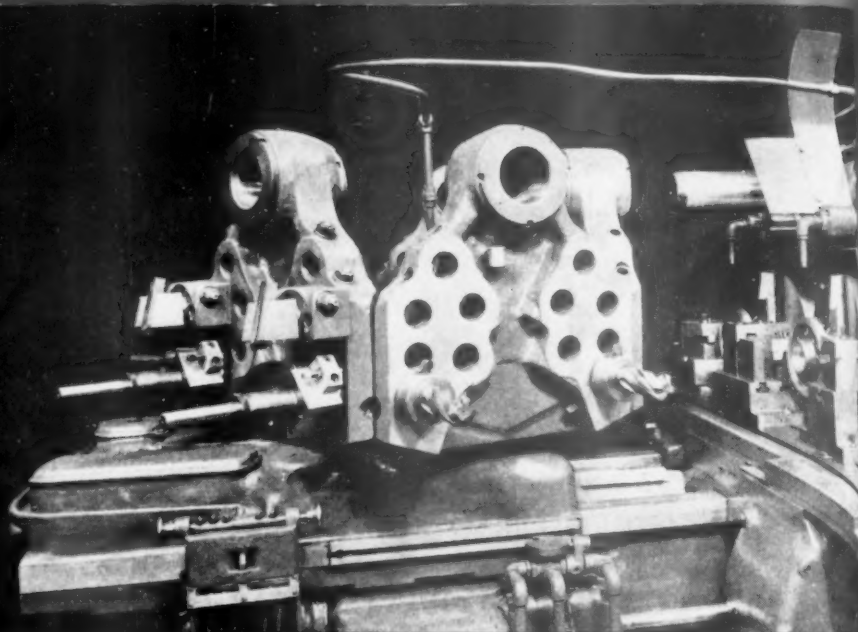
3rd T.F.: Finish cuts as roughed on 2nd T.F.

4th T.F.: Ream hole 1.488" dia.

Machining Time: One operation only — two subjects 4.88 min.

Floor to Floor Time: 5.38 min.

Production: 17.8 pieces per 51-min. hour.



● Increased output together with savings in power, floor space and initial investment are outstanding advantages offered in P&J 2 Spindle Automatic Chucking Machines.

Where there is an approximate balance as to diameters and length of principal cuts, these P&J machines perform two operations simultaneously on identical subjects. Two quite different holdings can also be performed. A cross slide unit mounted under chucks provides for rough and finish facing cuts or the operation of slide tools mounted on turret.

The job illustrated here and being performed on the P&J 5-D Two Spindle Powerflex, consists of machining gear blanks from

drop forgings in substantially one holding, leaving only boring and final finishing operations to be handled prior to the turning of teeth. Extreme rigidity of headstock and turret which are tied together while machine is under cut results in maximum cutting speeds and feeds, fine finish and high accuracy. A rugged overhead pilot, hardened and ground liberally dimensioned ways and a turret automatically bound after indexing contribute to maintenance of accurate work and minimum time for tool replacements or machine maintenance.

All these desirable qualities are inherent in the entire line of P&J Single and Two Spindle machines.

POTTER & JOHNSTON MACHINE CO.

Pawtucket, Rhode Island

PRODUCTION PERSPECTIVES...

News of Mass Manufacturing Everywhere



LABOR

With one goal, a military victory for the United States, labor will have to bury its hatchet. Strikes, walkouts, in fact every disagreement large or small will be forgotten as employee and employer together bring production into high gear. Even burly, fussy browed John L. Lewis said upon first hearing of the Japanese attack, "When the nation is attacked every American must rally to its support . . . All other considerations become insignificant." At Springfield, Massachusetts women went to work as machinists in the Springfield armory to meet an acute shortage of skilled male labor. They will work with veteran employees in the production of Garand rifles and, incidentally, are the first women employed there since the first World War. Down at Baltimore, the Glenn L. Martin Co., is going to pay Christmas bonuses totaling about \$1,000,000 to 30,000 employees. Out on the coast aircraft company payrolls in the Los Angeles area alone list 113,014 workers, 20,000 of whom were hired in the last three months. In spite of all the facts and figures on how many defense production hours have been wasted by strikes, the Army Ordnance reports that in the month of October they delivered to the Army 80 times as much fighting equipment and ammunition as they did in May of 1940.

PRIORITIES

As day after day of total war passes, defense production more and more subordinates consumer production and manufacturers turn to OPM Priorities Board in desperation for orders on raw materials and equipment. Director Donald Nelson has ordered the complete allocation of all steel plates. No person is to produce, deliver or accept plates except in accordance with the order of the director of priorities. Latest news on priorities order covering pig iron, steel, steel warehouses and special kinds of iron and steel, is that it has been extended to December 31, 1942. However, anything can happen now and the manufacturer will have to keep more than just a weather eye on Washington. Another

order, giving high ratings to certain materials essential to manufacturing of foundry equipment and repair parts, was extended to May 30. And with the current serious scrap shortage, dealers in iron and steel scrap were warned that they are expected to comply fully and immediately with scrap allocation orders issued by the OPM. It was pointed out that many allocations are being made daily to assist operations of steel mills with defense operations and therefore prompt allocation deliveries must be made to the mills. Another step taken by the Division of Priorities in December was to give materials entering into the production of resistance welding electrodes a preference rating of A-1-c. Users of cobalt who require less than 50 lbs per month were relieved of the necessity of filing monthly request forms, in a supplement to Order M-39 issued by the Director of Priorities.

FIGHTING EQUIPMENT

The first medium tank to be built with a cast steel hull will be delivered to the Army by the American Locomotive Co. The tank, known as the M-3A1, will eventually supplant the M-3 being built by various manufacturers. Chief advantages of the casting are its rounded contours which will deflect shells better than the flat surfaces of riveted construction; increased speed of assembly and lessened machining requirements. In fact the War Department reports that arrangements have been made for the construction and expansion of facilities for making rivetless armor, to cost \$53,000,000. Financed through the Defense Plant Corporation, it is part of the new army program to produce tanks at the rate of 3000 a month by sometime in January. Perhaps most interesting is that actual war experience has shown that the riveted type resulted in heavy casualties among crews because the impact of the shells frequently blew rivets loose and sprayed crew members. At least 30 per cent of future tank production will be devoted to fully cast steel hulls.

Then the new improved medium tank, "M4", starts rolling off the production line at the Lima Locomotive Works this

CLASSIFICATION BY APTITUDES



Drawn for THE TOOL ENGINEER By Ted Petok.



DUAL ADJUSTABLE Inserted-Blade Milling Cutters Speed Up Production Conserve H. S. Steel!

This type of cutter has a double action blade adjustment. When the blades are set out for regrinding, both **radial** and **axial** adjustments occur at the same time!

This not only simplifies setting the blades, but actually results in about **65% blade usability**, with a corresponding increase in the saving of high speed steel—of which our Government defense industries are now in great need.

LONGER
BLADE LIFE
DUE TO
AUTOMATIC
RADIAL
AND AXIAL
ADJUSTMENTS



O K Dual Adjustable cutters are made for either roughing or finishing. In the roughing cutter (above) the blades are inserted radially into the body and shear into the work in the direction of feed. Major wear and adjustment are on the periphery, the face of the blade merely scraping the work just cut. In the finishing cutter (left) the blades are inserted into the periphery and are ground with a slight lead to produce a "skiving" cut. Here major wear and adjustment are on the face. Free descriptive folder makes every detail clear. Send for one.

THE O K TOOL CO., SHELTON, CONN.



SYSTEM
OF INSERTED-BLADE METAL CUTTING TOOLS

PRODUCTION PERSPECTIVES

month while at Chrysler's Detroit arsenal a change over to the "M4", will be made as soon as materials for the "M3" are exhausted. The "M4" is not only a lower designed tank, but also has a cannon that can be revolved in a complete circle not found in the design of the "M3".

Reduction in production costs and increase in production speed are features of a revolutionary method of producing artillery shot perfected by the Tocco division of the Ohio Crankshaft Co., at Cleveland. An induction-heating method hardens the shot which is said to develop phenomenal armor-piercing qualities in the projectile.

NEW DEFENSE PLANTS

The Defense Plant Corporation has authorized a contract with the Sheffield Steel Corporation of Texas for the construction of a blast furnace and steel plant facilities "somewhere" in Texas. Estimated to cost over \$22,000,000, the plant will have an annual capacity of 274,000 tons of pig iron and 216,000 tons of steel plates.

On a wooded plain in Texas where cattle grazed seven months ago, now stands the world's largest black-out bomber factory. 4000 feet long, the equivalent of 12 city blocks, this huge plant being built under the direction of the Army Engineer Corps will, by next July, produce four-motored Consolidated planes with an ultimate production rate of 60 heavy bombers a month.

Chrysler's Airtemp Division Dayton plant has now completed its remodeling operations and now has enough additional space to manufacture parts for the Bofors gun and the Martin medium bomber.

And in Canton a plant that has long been in disuse has been revitalized by Timken for the exclusive purpose of producing the 37 mm one-piece armor piercing shot.

NON-DEFENSE PRODUCTION

With war production coming first, automotive manufacturers can expect anything in the way of curtailment. At Washington Cyrus McCormick, head of OPA's automobile section told dealers that both wholesale and retail prices must be regulated because, "A study of automobile prices shows that inflation already has started." The OPA notified auto dealers that it proposed to impose price ceilings and suggested two alternative formulas for fixing retail prices.

However, railroads are encountering increased passenger traffic and the Pennsylvania lines have announced the spending of \$3,500,000 on their modernization program which includes 100 passenger coaches.

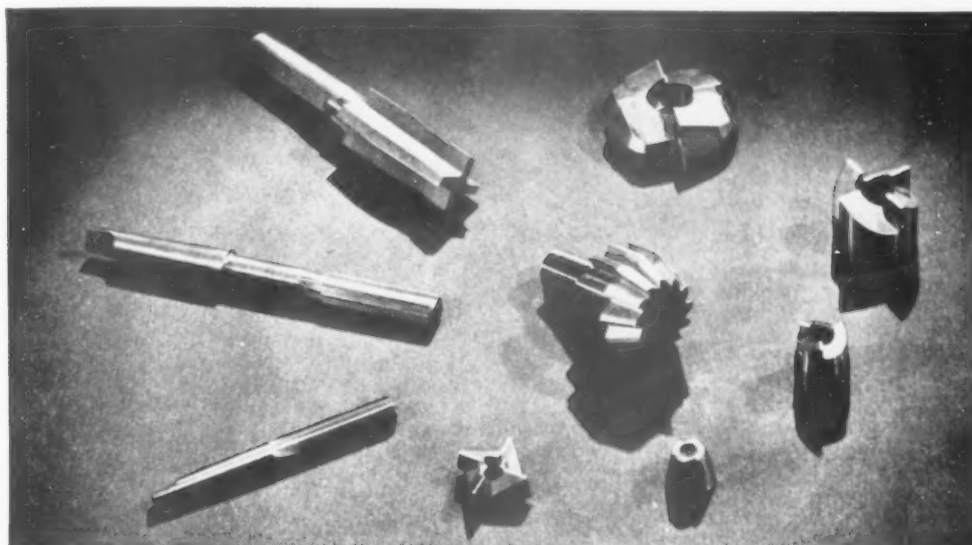
A registration statement covering 198,083 shares of Kearney & Trecker Corporation of West Allis, Wisconsin, one of the three largest manufacturers of milling machines in the United States, has been filed with the Securities and Exchange Commission. The shares to be offered are held by families of the founders and not the active management and constitute about one-half of the common stock of the company.

While in session at New York the resolutions committee of the National Association of Manufacturers urged the Government to bolster the little business man and encourage increased production by civilian industry as a "hedge against general inflation".

MATERIALS

Present statistics indicate a record 1941 use of approximately 52,000,000 gross tons of iron and steel scrap according to the Institute of Scrap Iron and Steel, Inc. This figure would compare with the previous record of 41,687,000 tons set in 1940. 1917 war time production record was 26,000,000 tons.

Are You Taking Full Advantage of HAYNES STELLITE TOOLS?



Special Tools Cast and Ground to Users' Specifications

Many types of special Haynes Stellite tools are regularly supplied, cast and finish-ground to users' specifications. These include solid bits, welded tip tools, milling cutter blades, reamer blades, brazed-in blade shell end mills, form tools, boring tools, and—as shown above—counterbores, spotfacers, and reamers. Complete information on request.

Used for Machining Practically All Metals

Haynes Stellite tools are efficiently and economically used for machining practically all machinable materials except chilled cast iron and manganese steel. They are used for nearly all machining operations, including turning, boring, facing, milling, reaming, grooving, and forming. These uniform, dependable tools operate at high speeds—with long life between grinds. This means high production at a low cost per piece machined.

Standard Tools Ready For Immediate Delivery

Solid Tool Bits—Square or flat—Wide range of sizes—Finish-ground ready for use in standard tool holders. Easily converted to various profiles as required for different operations.

Welded Tip Tools—A large variety of styles and sizes for use where solid bits are impracticable.

Milling Cutter Blades—For many cutter body types.



*Red hard, wear-resisting alloys of
cobalt, chromium and tungsten*

HAYNES STELLITE COMPANY

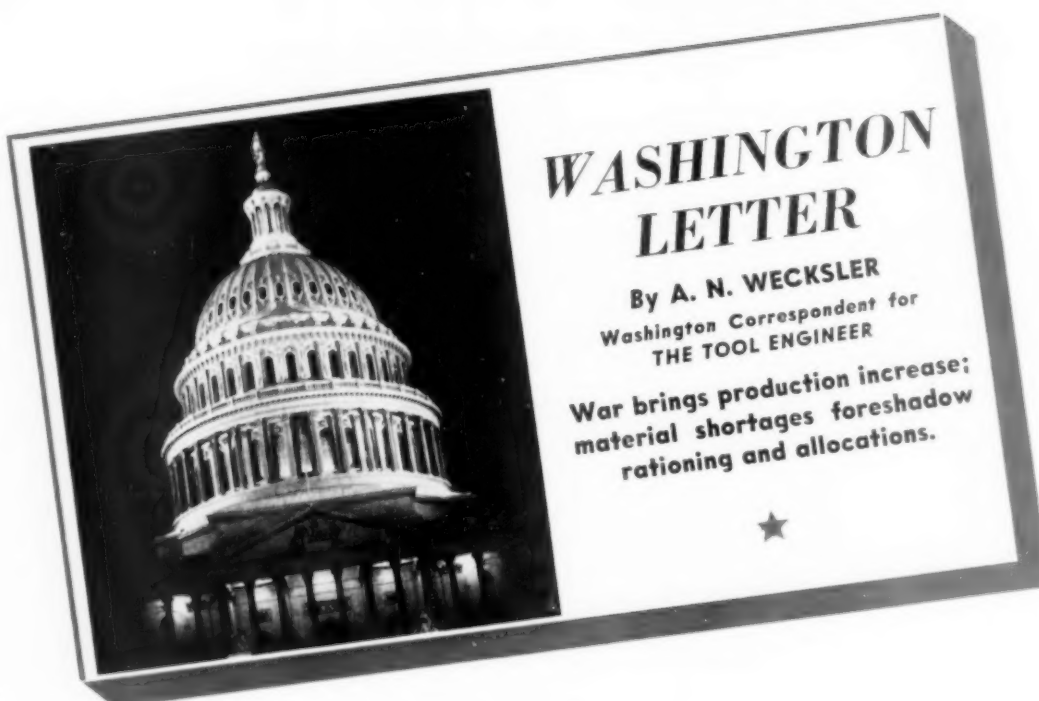
Unit of Union Carbide and Carbon Corporation

New York, N. Y.  Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• **HIGH-PRODUCTION METAL-CUTTING TOOLS** •

"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company.



PRODUCTION for defense now has to be geared to production for war, and in the process of this conversion, new and heavier demands are being made on the nation's tool industry.

Two problems are immediately an outgrowth of the shooting war—the first is the moving up of delivery schedules. The tooling up for conversion of civilian industry to war industry calls for a quicker flow of tools.

The second is the problem of alloying materials. Chrome, tungsten and high grade manganese originate in war-threatened areas.

Earlier delivery of tools now on order will be obtained though an individual study of each plant now producing tools. It has been the general premise that the facilities of plants capable of producing machine tools, and hand tools as well, have been pretty well loaded.

This concept will be changed under the impetus of a war emergency.

The deciding factor in this change will be the drive for a 168-hour work week. Obviously, seven-day three-shift operation cannot be generally achieved, but with this full-time operation as a goal, and with required concessions from labor to make a 168-hour work-week possible, the entire question of existing plant capacity is subject to review.

In connection with the inevitable tightening of restrictions on the use of basic metals, and the growing scarcity of alloying and hardening agents, there was one significant step taken by the Office of Production Management prior to the outbreak of the war—that of requiring producers of high speed steel to further restrict deliveries of tungsten steel in favor of the molybdenum type.

In an amendment to General Preference Order M-14, the OPM Division of Priorities provides that 75 per cent of all high speed steel orders accepted by producers in any one quarter be of molybdenum type, while the remainder can be of tungsten type.

However, a more valid indication of what the tool industry can expect is carried in the SPAB policy statement shortly after the surprise attack on this nation by Japan. In reviewing the question of critical materials from the Pacific area, SPAB announced:

"At four meetings this week, SPAB reviewed the stockpiles of these materials which are now available in this country, and worked out a program of policies for action insuring adequate military production even in case America's access to overseas sources of supply is cut off entirely."

Rationing Stockpiles

Rationing of stockpile materials will be scaled to a policy of thrift to stretch the supply existing in this country over the period of a long war. Use of substitute materials wherever possible, and development of Western hemispheric production, where feasible, are planned.

From the immediacy of the problem of increasing war production, there will doubtless be evolved a more simple plan of priorities and allocations to serve industry.

The priorities problems of the tool industry are the outgrowth of dual pressure—increased production burdens on essential industry brings with it need for a better flow of repair and replacement parts. Green labor adds to this problem.

The need for repair of existing tools is widely recognized in the P-22 repair and maintenance order, and in the series of special priorities orders giving special preference to the repair problems of specific industries.

As an illustration, there are the various segments of the tool industry that serve the mining industry. To obtain greater production of metals, new mining activities and an intensification of existing mining operations have been brought into play.

A direct outgrowth of this emphasis on mining is the need for aiding equipment and tool manufacturers serving the mining industry to obtain materials. Several special orders have been issued to take care of these manufacturers—one order to give recognized tool makers a priorities rating, and another specific order designed to aid small machine shops located at the mine pit heads and in the vicinity of mining communities to obtain materials.

By far the major pressure on the tool industry will continue to be the production of new tools.

It is likely that under the stress of war, new plant construction will gradually be dried up, with the exception of special purpose plants for the manufacture of explosives. However, the tooling up of new and expanded plant facilities will continue for some time.

In addition, there is the conversion of existing civilian plant facilities to war production. Each unit to be converted requires some tooling adjustments. These must be determined on the basis of individual study, and the adaptation of existing tools to new uses will require a degree of ingenuity.

NEED
FASTER
TOOL
"DELIVERIES"?

THIS DEFENSE SUB-CONTRACTOR
GETS SPECIAL TOOLS ON JOBS In Less Than 1 Hour!



West Bend Aluminum Co. Keeps Carbology Standard Tools In Crib; Quickly Grinds Special Shapes Needed

No delays awaiting "special" carbide tools at West Bend (Wisc.) Aluminum Company!

This former aluminum kitchenware manufacturer, now producing sub-contract defense parts, gets "special" Carbology tools on the job in less than one hour by this simple method:

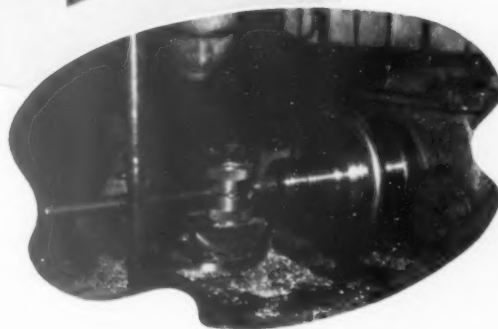
They maintain in their tool crib a nominal stock of Carbology Standard tools in 5 styles, 10 sizes (a total of 10 basic tools). From these "Standards," West Bend quickly grinds their own special shapes to meet 75% of all tooling requirements in their plant! To grind any of the special shapes used (15 shown above) is a matter of minutes. Weeks of waiting are thus often avoided.

***Carbology Standard Tools, available in 10 styles for cutting steel, cast iron and non-ferrous metals, are adaptable to 60%-80% of all turning, facing, boring operations. Manufactured in mass production quantities, Carbology "Standards" are always available for faster delivery than Carbology special tools. Keep a nominal supply in your crib for current needs . . . grind them to meet your special requirements . . . and you'll save weeks of delivery time on "specials" under present conditions. Write for standard tool and blank catalog GT-129.



CARBOLOGY COMPANY INC., 11145 E. 8 MILE BLVD., DETROIT, MICH.
Chicago • Cleveland • Los Angeles • Newark • Philadelphia • Pittsburgh
Worcester, Mass.

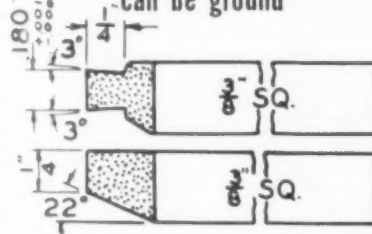
Canadian Distributor: Canadian Electric Co., Ltd., Toronto, Canada



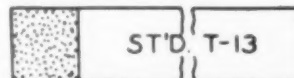
NO LONG DELAYS WAITING FOR
SPECIAL TOOLS ON THIS DEFENSE JOB!

To turn, face, bore these Ampco bronze airplane landing gear bearings, West Bend Aluminum Co., quickly grinds special shapes from Carbology Standards in its tool crib.

TOOLS FOR ABOVE JOB:
In 55 minutes these specials
can be ground



... from this Style No. 1 Carbology
Standard Tool



CARBOLOGY

Reg. U. S. Pat. Off.

STANDARD STOCK BLANKS
2 STYLES • 65 SIZES • 3 GRADES

Use the VISUAL GAGE

for the
Precision
Checking of



- ① Width and Thickness
- ② Height and Depth
- ③ Outside Diameter
- ④ Inside Diameter, Taper, Out-of-Round, Bell Mouth
- ⑤ Pitch Diameter of Screw Threads
- ⑥ Angularity of Surfaces or Between a Bore and a Surface
- ⑦ Run-out of a Roller with Respect to an Eccentric Axis
- ⑧ Parallelism of Surfaces or Edges
- ⑨ Two Dimensions Simultaneously

Suited to Routine Work of the
Tool Room • Production Shop
Inspection Department • Laboratory • Receiving Department

MAGNIFICATIONS: 10,000, 5,000, 2,000, 1,000 and 500 to 1
ALL MEASUREMENTS REFERRED TO PRECISION GAGE BLOCKS

THE **SHEFFIELD**
CORPORATION

Formerly—The Sheffield Gage Corp.

Gage Division • DAYTON, OHIO, U.S.A.



WASHINGTON

Pooling of the plant facilities of a group of plants presents an interesting problem in tooling up. In Britain, this practice has led to the closing of some plants, and the assembly of required tools gathered from the idle plants onto one plant site.

There will be a lesser necessity for such combination of tool facilities in this country, due to the substantial number of tools that do exist. In addition, there is the basic factor that while there is a shortage of metals and essential materials, this shortage becomes pronounced primarily as a result of the large industrial capacity of this nation's plants. In tonnage figures, the quantities of steel, copper, zinc, and lead which are available for the country's war effort are beyond comparison with the amount of materials available to the Axis, or any Allied nations.

Action of importance to Tool Engineers which is currently under way in Washington can be divided into three distinct categories—price control, increased production, and raw materials control.

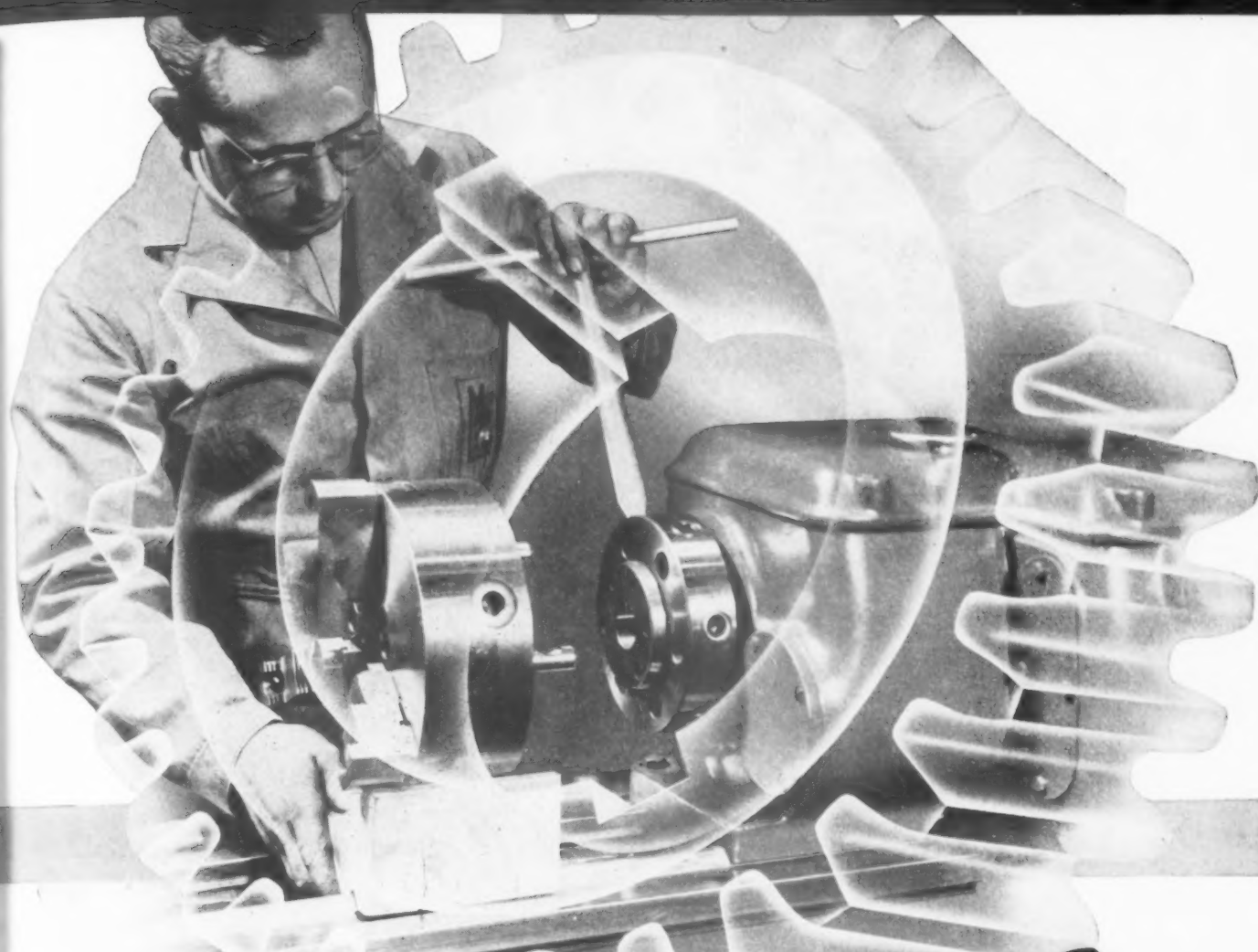
In the field of price control, Price Administrator Leon Henderson has conferred with machine tool manufacturers, and is holding a series of conferences with manufacturers of consumer-goods-machinery, such as textile machinery and shoe machinery. The Office of Price Administration is seeking to tighten its control over metal prices, and further action is likely in the field of scrap.

In the field of production, W. H. Harrison, director of the Production Division of OPM, indicated that a plant-by-plant survey is planned to determine how production can be increased. He contemplates a considerable increase in production when management becomes more familiar with war production, and green labor becomes skilled at new techniques.

The raw materials picture cannot be fully determined at present due to the changeover to a full wartime control policy.

A simplified system of allocations is forecast. The Production Requirements Plan will probably be made more simple, and therefore more workable, and some licensing system permitting industry to purchase materials, much the same as is followed in Britain, is in likely prospect.

In the interim period, priorities orders controlling metals and materials will be continued; repair and maintenance orders will be continued and extended; the number and variety of alloy steels will be reduced and simplified, and generally the controls over industry will become more direct.



GIVE CREDIT TO THE

Phantom Gear

FOR SPINDLE NOSE IMPROVEMENTS

SINCE Monarch first adopted the flanged spindle nose, its superior utility has been apparent. With the later introduction of the CamLock mechanism, affording quick and accurate mounting and interchangeability of chucks and fixtures, the lathe's usefulness curve took a sharp upward turn. Monarch users find that these features enable them to obtain faster and more accurate operation in tool-room and production.

The continuous flow of improvements sponsored by Monarch men streams from their endless desire to build better and more useful lathes. At Monarch, we call this urging force

THE MONARCH MACHINE TOOL COMPANY . . . SIDNEY • OHIO

"The Phantom Gear." From it comes to our engineers the inspiration for new and more efficient designs, and to our plant personnel the stimulus to supply more accurate, more sturdy, more productive machines.

★ ★ ★

Today, "The Phantom Gear" spurs us on to deliver a constantly increasing number of lathes for National Defense. And when the emergency is over, it will continue to inspire the building of still better lathes, to help American industry produce more goods for more people, at lower cost.

Monarch's March of Progress

Monarch builds only lathes, which is one of the reasons why many of the most important lathe advances come from Monarch, such as:

- Flanged spindle nose
- Anti-friction bearing mountings for all rotating parts
- Helical geared headstock
- Automatic force feed lubrication
- Anti-friction bearing taper attachment
- Flame-Hardened beds
- Automatic sizing for all size lathes

Even under the present delivery pressure, we are building better lathes than ever before. Now and in the future it will pay you to watch Monarch's developments.

MONARCH



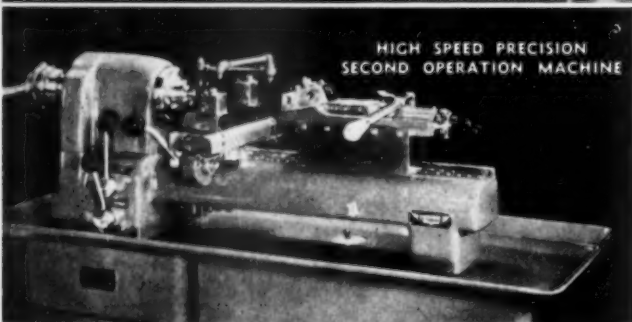
LATHES

COVER THE TURNING FIELD

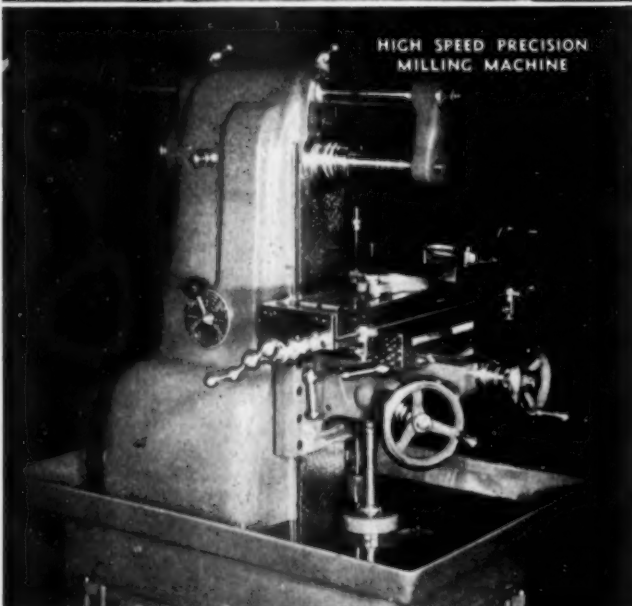
HARDINGE



HIGH SPEED
PRECISION LATHE



HIGH SPEED PRECISION
SECOND OPERATION MACHINE



HIGH SPEED PRECISION
MILLING MACHINE



HIGH SPEED PRECISION
TOOL-ROOM LATHE

WORTH REMEMBERING

(No. 1 OF A SERIES)

Today's extremely close tolerances and the requirement for high speed production have shown the real value of Hardinge High Speed Precision Machine Tools.

The use of the machines illustrated has expanded tremendously because of their ability to do, **BETTER** and **FASTER**, the work which was formerly done with larger machines.

Efficiency is essential in the present emergency because of needed production, but isn't it true, when costs and results are considered, the efficiency in machining operations is always important?

Many organizations were acquainted with the features of the Hardinge High Speed Precision Machine Tools and many were not. But, more organizations **NOW** realize the logic of using the proper size machine in relation to the work.

For the future, make certain that your range of production work is always efficiently manufactured—such a plan should incorporate Hardinge High Speed Precision Machine Tools.

HARDINGE BROTHERS, INC.

ELMIRA, N. Y.

Performance has established leadership for Hardinge

Aircraft Tooling at Intercontinent

With a five million dollar backlog, this nine building Florida aircraft factory is building sub-assembly units for bombers.

By G. RALPH KIEL

MIAMI'S first big defense plant, the nine-building factory layout of Intercontinent Aircraft Corp., in operation since last May, is approaching its goal of a Tool Engineering staff equal to that of any in the high production centers of the nation.

The \$2,000,000 aircraft factory with some \$5,000,000 in back log contracts, is building complete sub-assembly units, including the complicated center section, which represents 18 per cent of the total man hours in a complete plane. Also, fabrication of center wings, tail surfaces, cowlings and all related parts. Manufacturing operations embrace practically all of the essential work involved in building complete airplanes.

The company's aim has been to build a department able and equipped to design the most economical and efficient tool for the job at hand, and able to handle any product that may be manufactured now or in the future.

All executives and the majority of the personnel have had specialized training in the major industrial areas of the country, serving various industries in all branches of industrial engineering from that of developing products to laying out and planning complete equipment setups for both large and small plants.

Three Functions

The Tool Engineering department now comprises about 30 men on the drawing boards with another 10 men at desks engaged in tool planning and production engineering.

This division of the Miami plant divides itself into three main func-



Top: Equipment includes a 1,350 ton hydraulic press and an automatic electric heat treating furnace. Below: Tool Engineering Department.



NOW **ONE** SANDER DOES THE WORK OF THREE

... and Does a Better Job
WORRIED about help? Do you think that sanding is a slow-motion job that calls for scarce and skilled manpower? Be at ease! That's no longer true!

"SANDY" does the work of three hand sanders and releases your available manpower for **OTHER** work!

DON'T ASK US—ask the "Sandy users" in every industry! They're getting the profits and the speed that you're losing!

Sandy's method is easy. Sandy does three thousand CONTROLLED $\frac{5}{8}$ " strokes a minute—and he's easy to manage, even in the hands of an unskilled man. No wonder Sandy replaces three men with one man! Get the facts! Send the coupon today—while the problem is on your mind!

In Metal Working: Sterling Engineers are a concentration of fast, economical QUALITY metal finishing experiences—experience gathered in the finest plants across America. Ask to see a Sterling man!

Sterling
TOOL PRODUCTS CO.
373 E. OHIO ST. / CHICAGO, ILL.



**"I'LL DO YER SANDIN'
THREE TIMES AS FAST"**

Fill out coupon—drop it in the Mail
TODAY!

Sterling Tool Products Co.,
373 E. Ohio St., Chicago, Ill.

Please RUSH "Hints on Sanding Savings" to me at once!

Company

Address

City

State

Att'n of

— INTERCONTINENT —

tions: first, to layout the sequence of operation of the product itself; second, to plan the tools to match that sequence; and third, to design the tools. The tooling has been so designed that an order for 100 units, 1,000, or 10,000 can be turned out quickly.

Production speed commensurate with accuracy—that has been the standard applied to each tool design as it came off the drafting boards and was translated into templates, dies, machines or methods of operation. The standard has been met, but only



Radial Drill Press
It cuts through duralumin forgings.

by drawing fully upon the experience and determined efforts of the staff.

The problem of securing master tool and die makers has been taken into account in the designs for certain tools. While some parts of the tool or jig must be held to very close tolerance requiring experienced workmen, it was found possible to make other parts suitable for work of less experienced men, thus cutting costs and broadening distribution of the work.

Five Sources

Tooling at Intercontinent is complicated by the fact that work is being done for five different sources, and the organization must break down the various sets of drawings so the shop can work from a standard type of information. While involving extra work in the engineering department, this has resulted in smoother operation throughout the plant.

At present the plant is building ma-

THE TOOL ENGINEER

Simplify THE ORDERING OF YOUR STANDARD Cemented-Carbide TOOLS

ONE LOW
UNIT PRICE
for
ONE OR
FIFTY

Series
J - K
L - M
N - O
P - R

Series
100
0

SIZES AND SPECIFICATIONS

Non-Ferrous Cast Iron, Bronze, Etc.				Steel Cutting				Shank Size		Price
Roughing		Finishing		Roughing		Finishing		A	B	
R.H.	L.H.	R.H.	L.H.	R.H.	L.H.	R.H.	L.H.	Inches	Inches	
J-1	K-1	L-1	M-1	N-1	O-1	P-1	R-1	1/8	1/8	\$.85
J-2	K-2	L-2	M-2	N-2	O-2	P-2	R-2	1/8	1/8	.90
J-3	K-3	L-3	M-3	N-3	O-3	P-3	R-3	1/8	1/8	1.37
J-4	K-4	L-4	M-4	N-4	O-4	P-4	R-4	1/8	1/8	2.10
J-5	K-5	L-5	M-5	N-5	O-5	P-5	R-5	1/8	1/8	2.55
J-6	K-6	L-6	M-6	N-6	O-6	P-6	R-6	1/8	1/8	3.10
J-7	K-7	L-7	M-7	N-7	O-7	P-7	R-7	1/8	1/8	8.59
J-8	K-8	L-8	M-8	N-8	O-8	P-8	R-8	1/8	1/8	7.35
J-9	K-9	L-9	M-9	N-9	O-9	P-9	R-9	1/8	1/8	4.35
J-10	K-10	L-10	M-10	N-10	O-10	P-10	R-10	1/8	1/8	6.50

SIZES AND SPECIFICATIONS

Non-Ferrous Cast Iron, Bronze, Etc.		Steel Cutting		Shank Size	
Roughing	Finishing	Roughing	Finishing	A	B

THERE'S no guesswork . . . no waste of time . . . no chance for error when you order the standard tools manufactured by Carbide Fabricators—the cemented-carbide division of Morse Tool Company. These tools are supplied in four series, each of which is broken down into types for roughing and finishing non-ferrous metals, cast iron, bronze, etc. and for roughing and finishing steel. The price range has been so simplified that the same low unit cost applies to one tool or fifty.

These standard tools are now being produced in large volume in a plant that is equipped entirely for cemented-carbide work. A large

stock has been built up and will be maintained to the best of our ability to provide for 24 to 48 hour deliveries.

A four-page catalog folder listing all of the standard cemented-carbide tools manufactured by this company gives you *immediately* the exact information you require when ordering. Your order will get prompt attention and you will receive tools which will meet your most exacting production requirements. If you are not already supplied with an adequate number of folders so that every interested person in your plant will have one on hand, be sure to write for them today.

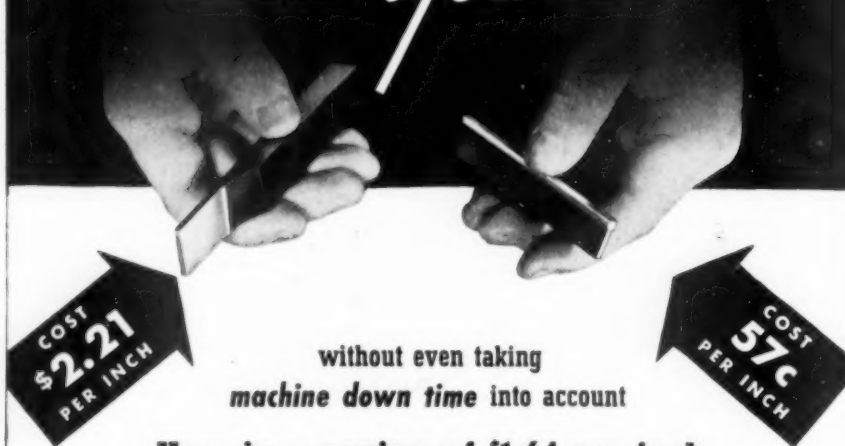
We are authorized suppliers of Carboloy, Firthite, Vascoloy-Ramet and Kennametal cemented-carbides.

Carbide Fabricators DIVISION OF

MORSE TOOL CO.

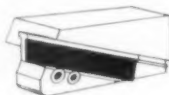
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Which cutting-off blade would *You* use?



Here is a saving of \$1.64 per inch

If cutting-off operations are a part of your production routine—and if the desire for increased speed with lower costs commands much of your interest—you should learn more about the Luers Patented Blades. These blades are setting production records in the leading plants of the country. In an aviation plant, for example, one Luers blade was used on one machine the whole day with only one sharpening every 24 hours and with only one inch of its length used in one week of its operation. Before Luers blades were tried in this plant one machine used four 8-inch blades every seven days. The plant runs 24 hours a day on 3 shifts. We can cite many other examples showing savings in time, money, and materials. There is a definite advantage in letting us demonstrate the efficiency of the Luers blade in your plant—without obligation, of course.



The Explanation . . .

FACTS REGARDING TOOL AT LEFT

Material—High speed steel

Size—5 ft. x 1 1/2" x 3/4"—7 lbs. at \$1.00 \$ 7.00

		Labor Hours
Operation 1	Saw to length, 4 3/4" (making 12 pcs.)	1/2
Operation 2	Shape top and bottom to 11/16"	1 1/2
Operation 3	Mill one side to 5/32" thick	1 1/4
Operation 4	Harden—12 pcs. at 25c	3.00
Operation 5	Grind top and bottom 21/32"	1 1/4
Operation 6	Grind sides to 1/8"	2 1/4
Operation 7	Grind end	1

7 3/4 hours at \$3 per hour 23.25
Total cost of 12 pieces forged type cut-off blades . . . \$33.25

With 1 1/4 inches of its entire length usable, the 12 blades give us 15 inches of usable blade, or an inch cost (\$33.25 ÷ 15) of \$2.21.

REGARDING TOOL AT RIGHT

The usable length of a Luers Patented cut-off blade is 3 3/4 inches. Therefore, the 12 blades will give a total of 39 inches usable blade. At a cost of \$1.85 each—12 blades will cost \$22.20 or an inch cost (\$22.20 ÷ 39) of 57c. So you arrive at the remarkable saving of \$1.64.

Forged Type Tools	\$2.21 per usable inch
Luers Patented Tools57
You Save	\$1.64 per usable inch

Produced under license issued by John Milton Luers Patents, Inc.

The Blades that
reduce friction

EMPIRE Tool Co.

8776 Grinnell Ave.
Detroit, Mich.

— INTERCONTINENT —

for assemblies that represent about 50 per cent of a complete high-powered combatant warplane and related equipment. The organization, however, stands ready and is fully equipped for the fabrication, assembly and fly-away delivery of finished planes.

Intercontinent Aircraft Corp. is an affiliate of The Intercontinent Corporation, export firm which has built plane factories in China and India over a period of years. W. D. Pawley, president of Intercontinent and chairman of the board of Intercontinent Aircraft, heads the organization.

Commander Bruce G. Leighton is president and general manager; George B. Arnold, vice-president and assistant general manager; and K. C. Walkey, works manager.

The plant has been designed and adjacent land secured to permit quick expansion of floor space to four times its present capacity. It has its own airport and runways. Fronting on N. W. Thirty-Sixth Street, just east of the Eastern Airlines terminal, the property on the south adjoins the Seaboard Airlines Railway break-up yards, and is within a twenty minute ride of downtown Miami. This means that transportation facilities of plane, truck and rail are readily available. There is a large parking area and cafeteria facilities for the employees.

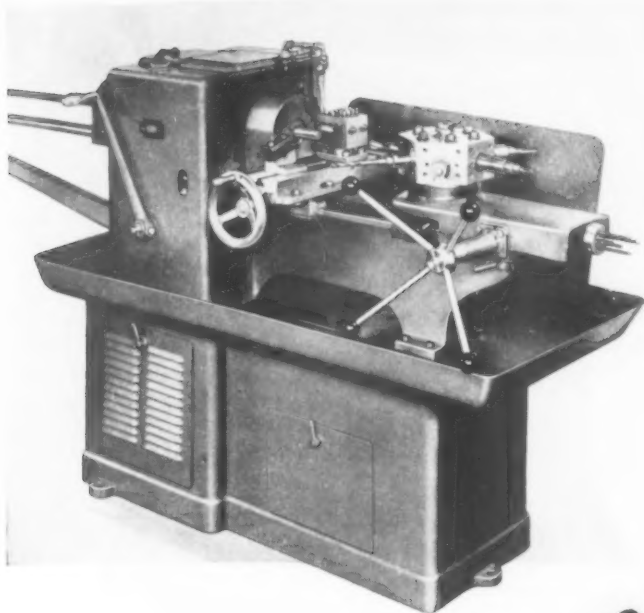
Now employing about 1,000 persons, the factory is working on a progressive employment schedule, calling for 1,600 by the first of the year and subsequent increases to approximately 2,500 when full capacity has been reached.

In the meantime, the drop hammer, the hydro press and other specialized machines are daily spewing out their parts into the rushing stream that is carrying the nation on to all-out aircraft production.

MACHINE TOOL PRODUCTION IN '42

At a meeting in Washington between OPM officials and representatives of manufacturers of machine tools making critical items for the armed forces, this year's production was set for an increase of 50 to 100 per cent over the 1941 volume. "We want all the tools you can make and we want them in a hurry," the representatives were told.

THE TOOL ENGINEER



**For Delivery
before April**

Hurry!

**Place orders now for the
OSTER NO. 601
SIMPLIFIED TURRET LATHE**



No. 601 is SIMPLIFIED. Ideal for rapid training of new men. Highly skilled operators not required.

Our enlarged plant at Cleveland, Ohio and our modern factory, at Erie, Pa., are teamed up to make deliveries of the No. 601 Turret Lathe *in 8 to 10 weeks from receipt of orders.*

Batteries of No. 601s are in action in numerous defense plants. Recently, 29 machines were ordered by one shell manufacturer for first and second operation work on 40mm shells.

No. 601 is a precision-built, bar and chucking machine; motor driven; equipped with either six position turret or plain saddle, as required. Optional types of drive: *direct* (for spindle speeds up to 3000 R.P.M.) or *worm drive* (for slower spindle speeds. Unusually heavy forming cuts are obtainable with the worm drive).

Automatic chuck capacity, round bar, is 1-1/2". Swing over bed is 14". Swing over cross slide is 6-1/2".

Complete details in illustrated Catalog No. 27-A. Send for copy NOW. See convenient request form below.

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Rush, by return mail copies of Catalog No. 27-A which contains full description and detailed illustrations of No. 601 Turret Lathe.

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A. S. T. E. DOINGS

By IRWIN F. HOLLAND



New Chapters

The night of November 28, 1941, will be a memorable one in the history of the A.S.T.E. for on that night three new chapters — Portland, Maine, Akron, Ohio and Fond du Lac, Wisconsin—were given charters. A new chapter for San Diego was chartered on the night of November 14.

Baltimore

Baltimore chapter held its regular monthly meeting on Wednesday, December 3 at the Sears Roebuck Auditorium, Hartford & North Aves., Baltimore, Md.

A dinner was served to about 40 members who later participated in the Technical Session held at 8:30 p.m. The attendance at the Technical Session was

attended by 65 members and guests. A novel idea originated by David K. Miller, chairman of the program committee to extend an invitation to the members of the Chesapeake Chapter of the American Foundrymen's Association, resulted in ten of them attending the joint session.

A technicolor sound movie was shown by the Norton Company, describing various types of grinding operations on cutting tools and snagging of castings. Mr. V. H. Ericson, Sales Engr. for Norton Company, answered many questions by the members.

Boston

The Boston Chapter held its regular meeting on November 27 with dinner at the Walker Memorial Bldg., Massa-

chusetts Institute of Technology. 110 members and guests attended the dinner and each received a pamphlet entitled "Physics of Metal Cutting" by Dr. Hans Ernst, of the Cincinnati Milling Machines and Cincinnati Grinders, Inc. No business was transacted at the dinner due to lack of time other than to introduce the honored guests, who were: R. Morris, Vice President, A.S.T.E.; Frank O. Hoagland, Master Mechanic, Pratt & Whitney Division, Lt. Robert A. Spence, Sec. & Treasurer, Boston Section, ASME. Olaf Ohlson, Master Watchmaker (retired), Waltham Watch Company. At a previous executive meeting, it had been voted to follow a suggestion made by Mr. Wm. D. Rodrick that they call upon three or four of the members at each meeting to give short talks on any subject that they were interested in, such as describing a new tool, gage, fixture or operation. Each talk was to be limited to five minutes. Those selected to talk would not be called upon again until they had gone through a list of members.

Henry Richards introduced each of the following: Wm. D. Rodrick, Tool Supervisor, General Electric Company, River Works, whose subject was "The Evolution of a Face Milling Cutter." He described how his department had solved a difficult problem in which the cutter cost was 47c per piece and by designing a T-C tipped inserted blade cutter they were able to obtain a cost per piece of 1.7c. Walter B. Pohle, Superintendent, Spray Engineering Company, Somerville, discussed a Combination tool he had designed for use in drilling, reaming and spot facing nozzles for spray guns. He had with him a vee type vise, spring type jig, and special solid counterbore converted to have a drill point, reamer, face cutter. He described the operation and stated that production was improved 500% over older methods. N. G. Brownsword, Principal Gage Designer, Watertown Arsenal, described the method used in making tubes for dental and shaving creams. His talk was accompanied by numerous sketches which he had made on the blackboard before the meeting.

Oscar Berg, Tool Engineer and Tool Foreman, Mason-Neilan Regulator Co., Dorchester, described the method and tools used at his plant in threading between two flanges close together.

Mr. C. A. Lockwood, Chairman, then introduced the speaker of the evening, Mr. Frank O. Hoagland, Master Mechanic, Pratt & Whitney Division, Niles-



Following a dinner at the Hotel Retlaw the night of November 28, an organizational meeting was held at which the charter for the new Fond du Lac chapter was presented. Pictured above are the forty-one applicants for membership, the four applicants for transfer and officials of the A.S.T.E. W. E. Rutz acted as the temporary chairman and introduced Otto Winter, first vice president, who took charge of the meeting. Speaker of the evening was Clifford E. Ives of the Milwaukee OPM office.



On the same night in Akron a charter meeting was held in the Mayflower Hotel where the Charter of Chapter 47 was presented to the fifty-eight applicants and officers by Clyde Hause, A.S.T.E. national secretary. The officers elected by the chapter are pictured above. From left to right: E. S. Woodhall, chairman; Ray Allen, vice chairman; and G. A. Irwin, secretary. M. R. Dague was elected treasurer. E. W. Beebe, active in the organization of the new chapter, introduced the speaker, C. V. Briner of Cleveland, regional director. Frank Crone, national treasurer, was also at the meeting.

STOP ALL THE WASTE

OF OLD-TIME METAL CUTTING

- ★ WASTE OF TIME
- ★ WASTE OF POWER
- ★ WASTE OF LABOR
- ★ WASTE OF ENERGY
- ★ WASTE OF METAL



DO-ALL
Contour Machine
BAND SAWING
BAND FILING
BAND POLISHING

4 CORNERS CUT IN 4 HOURS

With the DoAll a $4\frac{1}{2}$ " x $1\frac{1}{2}$ " cut was made in each corner of this 18" thick, 945-pound MO-LYB-DIE Hardtem B block. It took only one hour to notch each corner. The saw cut very straight and the job turned out beautifully.

—Lansing Drop Forge Co., Lansing, Mich.



12 HOURS 40 MINUTES SAVED

Four pieces of Water Hardening Tool Steel 2" x 10" x 11" formerly done on shaper in 14 hours, now sawed on the DoAll in 1 hour and 20 minutes.

—Swanson Tool & Machine Co., Erie, Pa.

SAVE with the **DoAll**

This ultra-modern machine tool offers you the fastest, most efficient way of removing metal, any kind, from the hardest high carbon steel to soft brass. Does internal and external band sawing, filing and polishing. The DoAll cuts corners all along the line—takes the place of shaper, milling and lathe work in industrial and defense plants everywhere.

Let us send a factory trained man to your plant to demonstrate just what a DoAll can save you.

FREE — Literature and 158-page Handbook on Contour Machining. Send for copy today.

CONTINENTAL MACHINES, INC

1304 S. Washington Ave., Minneapolis, Minn.

Associated with the DoAll Company, DesPlaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines.



An all-time record of 156 charter members was established on November 14, when San Diego Chapter 44 received its charter from Frank Curtis, national president of the A.S.T.E. Pictured above are, John J. Tucker, newly elected chairman (left) and vice chairman Floyd Cox. Other officers elected were Richard J. Oertel as secretary and J. Grant Cline for treasurer. Among those who spoke during the evening were Dwight C. Jones, chairman of the Los Angeles Chapter, and Ralph Oversmith, chief tool designer for Consolidated Aircraft.

Bement-Pond Company, Hartford, Conn., who spoke on the subject "Jig Boring and the Many Problems Connected Therewith." Mr. Hoagland opened his talk with a description of the origin of the various units of measure and startled

the crowd by stating the system of measurement, with which everyone is so familiar, has never been legalized by our Government. Mr. Hoagland pointed out on the slides the various features brought up in his talk. He stated that

blueprints should be properly drawn for the use of the jig borer operator and explained the proper method to use.

Buffalo Niagara Frontier

The Buffalo Niagara Frontier Chapter held its monthly meeting on November 27 at the University Club. The meeting was preceded by an excellent roast beef dinner.

Mr. H. A. Frommelt, Director of Industrial Research, Kearney & Trecker Corporation, was the speaker for the evening. Mr. Frommelt's talk was illustrated with slides on "Plastics in Defense". The movies and slides on tools, dies and equipment needed to produce finished plastic articles illustrated clearly what this new field will mean to the Tool, Die, and Machinery industry.

The next meeting was held at the University Club in Buffalo Thursday evening, December 18, and the Chapter was honored by having Mr. Frank Curtis, National President, as the speaker. It was also a joint meeting with Erie County Chapter of the Society of Automotive Engineers as guests of the Buffalo A.S.T.E. Chapter.

Central Pennsylvania

The Central Pennsylvania Chapter held its monthly meeting at the West York Inn on November 11th. Following

NOW ON A NATIONWIDE SCALE

The Tuff-Hard Corporation has recently been granted certain patents involving methods and equipment in the heat treating of high-speed steels.

This action means that the company is now in a position to offer on a nationwide scale a process which, when applied to high-speed steels, produces a remarkable combination of toughness and hardness—and which, heretofore, has been restricted to certain manufacturers and cutting tool companies in the greater Detroit area.

Being particularly effective on Moly steels, it enables former exclusive users of Tungsten and Cobalt types of high-speed steel to again achieve maximum machine tool efficiency—

because the Tuff-Hard process, to all practical purposes, brings the Moly's to parity with the Tungstens and the Cobalts!

In addition, it is susceptible to a wide range of applications with most of the currently available high-speed steels. We are prepared to submit data and convincing proof based on the actual experience of some of America's most highly regarded machine tool operators. A letter or telegram will bring a response from one of our engineers, who is qualified by metallurgical and practical experience to help you select the correct grade of available high-speed steel and heat treatment for the most difficult application.

TUFF-HARD CORPORATION

5960 Caniff Avenue

Detroit, Michigan

TUFF-HARD

STEEL HEAT TREATING TUFF-HARD PROCESS CUTTING TOOL BITS

WAR MATERIEL IS NO MORE ACCURATE THAN THE GAGES THAT INSPECT IT...

Marksmanship is the final link in making sure that the shell reaches its mark. All along the line, from specifications to the finished gun or shell, inspection of parts for accuracy makes sure that the gun will shoot as the marksman directs. Speed of inspection is of almost as great importance as accuracy. Federal Dial Indicators and Gages inspect accuracy of parts *with speed* and they *eliminate human variations*. Write for data on inspection gages for defense work to —

FEDERAL PRODUCTS CORPORATION
Providence Rhode Island

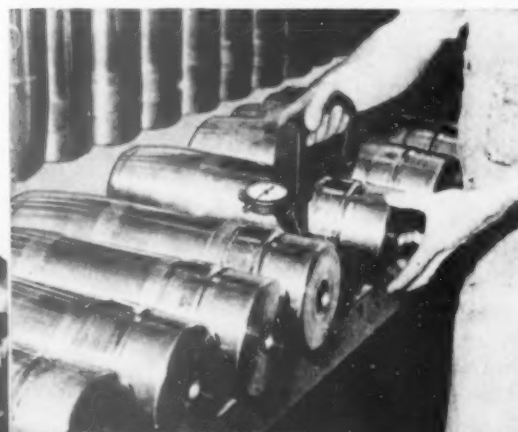
RECOIL CYLINDERS
AIRPLANE DETAILS
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GUN PARTS
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SHELLS
BOMBS
FUSES
ETC.
ETC.



Checks both "lands" and groove diameter of various size gun bores.



Checks diameter and depth of grooves in recoil cylinders. Below — Dial Indicator Snap Gage.



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PRECISION MEASURING INSTRUMENTS

Chicago • Cleveland • Detroit • Hartford • Los Angeles • Milwaukee • Montreal • Muncie
New York • Philadelphia • Pittsburgh • Rochester • San Francisco • St. Louis • Toledo • Toronto • Windsor

the dinner, a sound movie was shown. The movie, produced by the Treasury Department of the U. S. Government was entitled "Know Your Money."

Mr. Grass, in charge of the meeting, introduced the speaker, Mr. C. H. Parker of the Leeds and Northrup Company, Philadelphia, Pa. Mr. Parker spoke on "Modern Heat Treating Equipment," using quite a few slides to illustrate his remarks.

Chicago

The regular monthly meeting of the

Chicago Chapter was held at the Midwest Athletic Club on December first. A large crowd was present and after dinner several members of the executive committee presented reports on their activities.

Two films were shown. The first was a new film on steel production for defense furnished by the Allegheny Ludlum Steel Corporation, "There's a Job to Be Done."

Mr. E. T. Snider of the Cleveland Twist Drill presented the second film, "Uses and Abuses of Twist Drills."

Cincinnati

In November the A.S.T.E. Cincinnati Meeting was held at the Hotel Alms. The subject of the talk and open discussion was "Abrasives." The regular December meeting was held on December 9 at the Ohio Mechanics Institute in Cincinnati. The subject of the talk accompanied with slides was "Precision Boring," presented through the courtesy of the Heald Machine Company.

Dayton

The Dayton Chapter 18 met on November 10th at the Gibbons Hotel and heard Mr. Raymond C. Suran who is in charge of the Cincinnati District of the Federal Bureau of Investigation. Mr. Suran gave us a very clear description of the operating methods and purposes of the F.B.I. and stressed the importance of public cooperation toward successfully combating sabotage and other subversive activities.

His talk was followed by a "March of Time" film which also described the inner workings of the F.B.I. and cited case histories.

The program was preceded by a dinner and patriotic song fest and a brief business session at which time subscriptions were started to secure a slide projector for use by the Chapter.

Grand Rapids

The December meeting of the Western Michigan Chapter was held in the Browning Hotel in Grand Rapids. The meeting, a supper meeting, was attended by 65 members and their guests. After the regular meeting, the question and answer period was opened. The big question discussed was what to do when defense orders are received, requiring a complete change-over of methods and equipment. After several minutes of discussion, two engineers were appointed to investigate in the various city plants their methods and troubles, and report back at the next meeting.

The speaker of the evening was Mr. Frank W. Curtis, national A.S.T.E. president, who is also Chief Engineer of the Van Norman Machine Tool Company of Springfield, Mass. His subject was "Tool Engineering." Mr. Curtis illustrated his lecture on the fundamental principles of tool design with slides made from machines now in use in modern machine tool plants.

Hamilton District

The regular monthly meeting of the Hamilton District Chapter was held for the first time in St. Catharines, Ont. on Thursday November 13.

The guest speaker, Mr. F. D. Bowman of the Carborundum Company, gave a

In Action on Shell Turning!

Stuart's
SOLVOL
AQUAMIX
Liquid Cutting Compound

"Rough Turning"

"Finish Turning"

Highspeed SHELL TURNING with cemented carbide tools and scores of other tough metal-working operations function better with this genuine new development.

Stuart's Solvol Liquid Cutting Compound, unique in the field of tool lubricants, is already in wide use at many of America's largest and best known munitions plants. It is solving cutting problems and definitely doing its part in speeding up production. Try it quickly and benefit by the obvious improvement and economy.

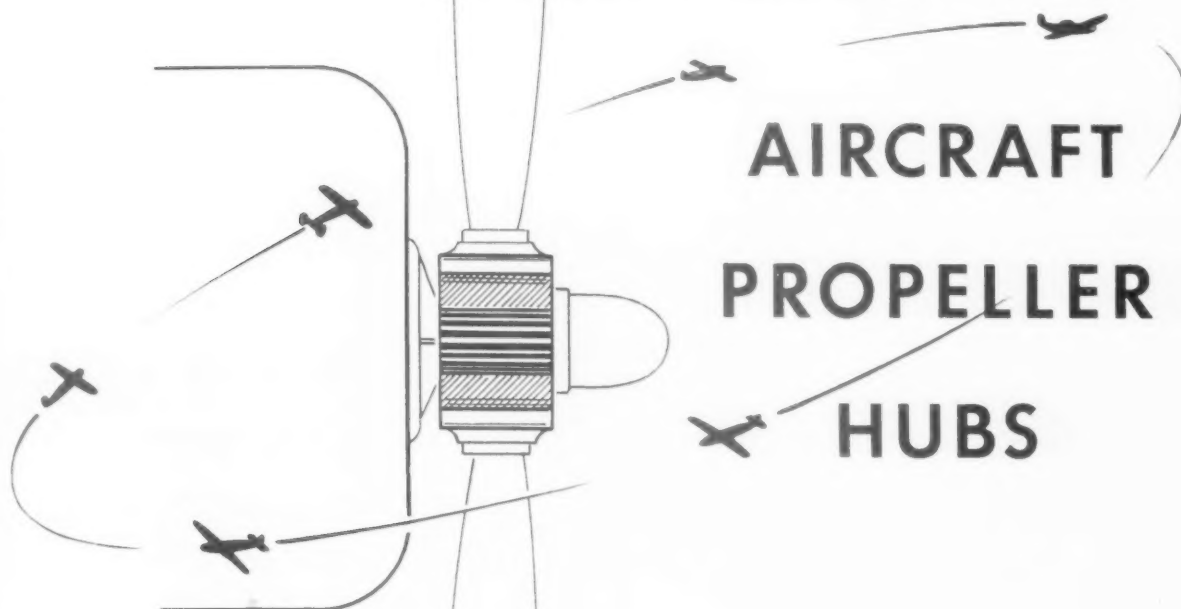
Photos Courtesy of International Harvester Company

Wire for production sample—free to any concern working on defense.

For All Cutting Fluid Problems
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865
Warehouses in All Principal Metal Working Centers



Broaching MAKES POSSIBLE TODAY'S PRODUCTION OF



In many production cutting operations so vital in today's armament program, broaching alone provides the necessary speed and accuracy. In some cases, no other method could be employed to produce the same results even if time was no factor.

A typical example is the cutting of the splines in aircraft propeller hubs. Here is a job that calls for extreme precision. Not only must the original mating of propeller shaft and hub be exceptionally accurate, but interchangeability and replacement in the field must also be taken into consideration.

Detroit Broaches are used to produce the hub splines. Spacing is held to an almost negligible accumulative error. And because of the production volume made possible by broaching, these parts can always be turned out in adequate quantities to meet assembly needs.

In the aircraft and all other important industries, Detroit Broaches continually contribute to the fast, accurate production required in today's Victory Program.

DETROIT BROACH COMPANY
20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

talk on "Abrasives in Industry" followed by a sound film illustrating some of the many uses of abrasives in the industrial world.

The big social event of the season was the Dance at the Ancaster Golf & Country Club on Friday, November 21. All other Chapter Officers with their ladies were on hand early to welcome the more than 200 guests.

Milwaukee

Milwaukee meeting on Thursday, November 13th, members heard Mr. W. R. Breeler, Assistant Director of Re-

search, Allegheny Ludlum Steel Company, on "The Three Grades of Moly Steel. Their Characteristics, and Uses".

Following the speaker, Mr. Gene Bouton, Regional Director for the Racine and Milwaukee Chapters, gave a resume of his experiences at the recent semi-annual tool convention at Toronto, Canada. Mr. Bouton's report included experiences which he had in observing the making of some of the latest type aircraft guns, and noted the progress which the Canadians had been making in their all-out effort to support the mother country. He thought they still

had much to learn from the American system of production, but thought that they were making great strides in their munitions factories.

Greater New York

Greater New York Chapter held its December meeting on Monday, Dec. 1, in the North Ballroom of the Hotel New Yorker. Mr. L. T. Weller of the Works Laboratory of the General Electric Company, Schenectady, N. Y., gave a talk on the cutting action of tools as revealed by high speed photography. Three reels of high speed pictures showed the cutting action during various milling and planing cuts on steel, brass and cast iron. These were followed by one reel of pictures of punch press work showing notching dies in action on silicon steel and low carbon.

The use of high speed photography makes it possible to actually see in slow motion what takes place at a rapid rate or high speed. Thus, it was clearly shown in these pictures that for milling operations on non-crumbling metals, such as steel, a smoother cutting action is obtained by using cutters which either have no rake or a negative rake.

There were approximately 175 members and friends in attendance.

Ontario

The Ontario Chapter held its monthly meeting at the Oak Room Union Station, Toronto on November 14. There were ninety-five present for dinner and about sixty came for the meeting.

The Chairman announced the increase in membership dues, and welcomed the large number of guests which were present.

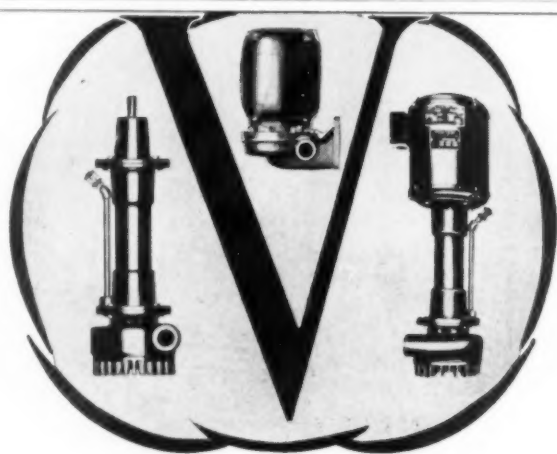
A silence of one minute was kept by all those who were present, standing, in memory of Mr. Ford R. Lamb.

The speaker of the evening was Mr. H. S. Indge, Lapping Engineer of the Norton Company, who spoke on the subject of "Refining of Round Surfaces."

Peoria Area

The Peoria Chapter made Saturday evening, December 6, a memorable one when it entertained its ladies at a dinner and dance in the LaSalle Room of the Pere Marquette Hotel.

Approximately 130 men and ladies enjoyed the dinner and the half hour of entertainment which preceded the dancing. Among the guests present were Otto W. Winter of Chicago, national vice president of the A.S.T.E.; Ed. W. Dickett of Rockford, chairman of the national membership committee, A.S.T.E.; Joe Morgenthall of the Tri



Keep 'em flowing

LUBRICANT AND COOLANT PUMPS MUST NOT FAIL!

Production must go on. The speeding gears that operate unnoticed under cover—the whirling drills that push into tough metals—the valuable cutters that bite off vast quantities of steel—all must have lubricant or coolant—constantly and in the right amounts—right from the very instant the wheels start moving—it must "be there" when needed.

*Pioneer Pumps
are dependable*

The increased facilities provided through our new home assure you of quick deliveries. Send for a complete catalog showing sizes and models.

PIONEER ENGINEERING & MFG. CO.

19643 JOHN R STREET • DETROIT, MICHIGAN

Your JOB IS *Our* JOB

... *now*, more than ever before!

We're all working at the same bench, to answer the "Full Speed Ahead" signal. Your job is our job—*helping to make better tools.*

Making tools that will produce more pieces in less time is a job that you and Carpenter can do *together.* Getting continuous production from machines and presses, with fewer interruptions for regrinding, repairing and replacing tools, is more than a one-man job.

Just as always, Carpenter's policy of help to tool steel users goes beyond the supplying of quality tool steels. Continuous production calls for good design, careful steel selection, expert tool making and exact heat treating procedure. Right there is where Carpenter can help you—with a *simplified* program for the proper selection and correct heat treatment of tool steel to do each job.

As a part of that program, we offer this handbook, "Tool Steel Simplified." It is being used in tool rooms, machine shops, and heat treating departments—to make *every* pound of tool steel contribute its share to *faster* production.

The chapter on "The Relation of Design to Heat Treatment" contains hints that have already saved many hours and much valuable tool steel in many tool rooms. Three chapters on heat treating procedure make this handbook a particularly valuable reference source for the tool engineer. "Tool Steel Simplified" helps train apprentices faster and is a good "refresher" course for tool makers.

Over 22,500 copies of "Tool Steel Simplified" are at work helping plants produce *better tools* that will do the work *more quickly.* It answers questions like these: *How* to stop tools from warping? *How* to avoid grinding checks? *How* to make tools wear longer? *How* to prevent size change? *How* to be a trouble shooter?

The price of "Tool Steel Simplified" is only \$1.00 postpaid in the United States—\$3.50 elsewhere. Send today for this aid to better tools and higher production. We believe that after you have read "Tool Steel Simplified", you will want more men in your plant to have copies of this valuable and helpful book.

THE CARPENTER STEEL COMPANY

Dept. 41 Reading, Pa.



Over 22,500 Copies
now in use

"TOOL STEEL SIMPLIFIED"
by Frank R. Palmer
Vice President
The Carpenter Steel Company

315 pages—205 illustrations

\$1.00 postpaid in U. S. A.—\$3.50 elsewhere



Cities Chapter: John E. Gilchrist, regional director A.S.T.E., and W. Z. Fidler, chairman Tri Cities Chapter.

Philadelphia

The Philadelphia Chapter held its regular November meeting and dinner at the Engineers' Club, Philadelphia, on the 20th. The after-coffee speaker, Mr. P. W. Arnold, Application Engineer for The Reliance Electric & Engineering Company, Cleveland, Ohio, was introduced by Mr. Charles Crook, Jr., vice chairman. Mr. Arnold's talk, "V.S. All Electric Adjustable Speed A.C. Drive

for Machine Tools," was illustrated by slides showing a variety of applications to machine tools, both old and new models. He also had on display two motors, which were connected up with the house current and used to demonstrate the manual control and automatic control by rotating gears at practically any speed required. Mr. Arnold answered numerous questions afterwards.

The next speaker introduced was Mr. W. P. Powers from U. S. Tool Co., Inc., Ampere (East Orange), New Jersey. Mr. Powers' subject was "Multi Slide

Presses and High Production Millers," which were illustrated by slides and motion pictures of actual production.

Mr. J. A. McMonagle, chairman, then conducted the business meeting of the Chapter. Mr. Paul W. Frankfurter, Sr., Chairman of the Membership Committee, reported on the drive for new members, which is going over in a big way.

A 20-lb. turkey donated by Mr. Henry A. Simpson, secretary, was given to the holder of the lucky dinner ticket.

Pittsburgh

The December meeting of the Pittsburgh Chapter was held at McCann's Restaurant, Pittsburgh, on Friday evening, December 5, 1941. The speaker of the evening was Dr. Allen Bates, Manager of the Chemical and Metallurgical Division of the Research Laboratories, Westinghouse Electric & Mfg. Company, the subject being "Metal Versus Non-Metals."

A month ago the Chapter heard a speaker describe the making of tools for the forming of resins, and at this meeting Dr. Bates brought in the other side of the picture, giving a thorough and complete picture of the making of resins. He performed an experiment before them by mixing three liquids, he then produced a pinkish-colored substance which was bakelite.

Portland

One of three new chapters which received their charters on the night of November 28, Chapter No. 46 of Portland elected Edwin R. Andrews of Bath, Maine as chairman. The organizational meeting, held in the Columbia Hotel, also elected Joseph E. Perry, Pine Point, vice chairman; Charles E. Paige, Portland, secretary and Calvin L. Fickett, Portland, treasurer.

The organization covers Maine and New Hampshire and about forty were present to hear Frank W. Curtis, national president of the A.S.T.E. Just back from a tour of the West Coast. Mr. Curtis said that the aviation industry has now overshadowed the automotive in scope and that plants which previously needed six months to turn out a bomber now construct one a day.

He predicted the present shortage of cutting tools will correct itself in the next six months and that the machine tool industry will exceed a billion dollars worth of tools next year.

Ray H. Morris, second vice-president also spoke, stressing the importance of the Tool Engineer's work.

Rockford

For the first time in the Chapter's history, Ladies' Night was celebrated with 100 members bringing their wives and

TECO CARBIDE TOOLS meet the Urgency of WAR PRODUCTION!

War's grim reality puts on every machine shop the great responsibility of increasing production to the utmost. TECO CARBIDE TOOLS, with their extraordinary capacity for high speed turning, boring, facing and other machining operations, offer a powerful weapon for Industry's share in the battle. Increased output per machine will not only help us win the war we face today, but it will help the user of TECO CARBIDE TOOLS to hold an "edge" in the competitive period sure to follow the war.

Equip yourself for the battle of production NOW and the battle of costs LATER, by using TECO CARBIDE TOOLS.

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HEALD


WAS A

*precision
producer*

IN 1917

One of several batteries of No. 60 Heald Grinders finishing the bores of cylinders for the Liberty airplane engine at the plant of the Lincoln Motor Car Company in 1917 for American planes in World War No. One.

AND *Now again in* 1942



GRINDING FOUR
RODS AT A TIME.


One of the most exacting jobs during the first World War was the finishing of the bores in the famous Liberty airplane engine cylinders. As shown above Heald machines were selected to produce the desired requirements.

Precision in 1917 was recorded in thousandths; today it has shrunk to not only tenths of thousandths, but micro inches. Demanding these close tolerances, industry is again looking to Heald for precision finishing of not only airplane cylinders but scores of other airplane parts such as:


Motor end shields — gear cases — camshaft housings — propeller cams — connecting rods — landing gear fittings and absorber cylinders — valve tappets — propeller hubs — crankshafts — pistons — bearings — propeller blades — housings and casings of all kinds — spark plugs — magneto parts of all kinds — carburetor bodies — oil pumps — gears — cylinder muff — master rod — articulating rod — range finders — propeller shafts — pump casings and other parts too numerous to mention.

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WORCESTER, MASSACHUSETTS, U. S. A.

*Airplane engine parts manufacturers
should contact Heald.*



BORING MAIN BEARINGS
IN CRANKCASE ASSEMBLY.



GRINDING STRUT
CYLINDER.



TURNING
PROPELLER
BLADES.



GRINDING TAPER S
IN PROPELLER HUB

lady friends. Mr. H. F. Ruehl, chairman of Rockford Chapter, officiated. Dinner was served at 6:30 p.m.

Dr. John J. Caton, director of the Chrysler Institute of Engineering, gave the principal address. His subject was "Common Sense in Education." Dr. Caton pointed out the necessity of a training program for engineers after they graduate from college. He compared this with the internship for graduating doctors and illustrated how this training program would raise the standard of the engineering profession. Several concrete examples were given by

Dr. Caton of new and improved products being developed by the engineers going through their training course and in turn providing a substantial return to the company on their investment of such a training program.

Another interesting point which was brought out in Dr. Caton's talk was the method of fitting the job to the man, and not the man to the job, through an educational training course in the Chrysler Institute of Engineering. Such a program allowed them to take into consideration the human equation and prevented misfits from getting into jobs

not suited for the particular individual.

St. Louis

The St. Louis Chapter held its last regular meeting of the year 1941 on Thursday, December 11, at the Melbourne Hotel, with most of the members in attendance. The business session placed marked emphasis on the Annual Christmas Party and Dance to be held December 20, and also the Annual Meeting of the National Society to be held in St. Louis next March. The Chapter was honored by a visit from national publicity chairman, "King Cole", who briefly addressed the meeting. The technical session is well described in the following excerpt from the St. Louis Globe Democrat: "The Government's gauge system used in the production of war materials, chiefly guns and shells, has an interchangeable manufacturing feature, which makes production cheaper, less wasteful and faster, Leon Dwyer, gauge engineer at the Watervliet Arsenal, Albany, N. Y., told 125 members of the American Society of Tool Engineers last night at Hotel Melbourne. The system adopted following discovery of manufacturing mistakes in World War I, permits manufacture of component parts of shells and guns at any plant in the country, Mr. Dwyer said. He told how all tools used in manufacture of parts for ordnance supplies are numbered. The numbers are standardized by the Government and makes each tool and fixture easily identifiable. Use of the system, Mr. Dwyer pointed out, enables the Government to simply place an order with a manufacturer with the knowledge that the gauge plan will produce uniformly standard products. Electric gauges are employed in final tests, subjecting all products to microscopic accuracy examination."

Schenectady

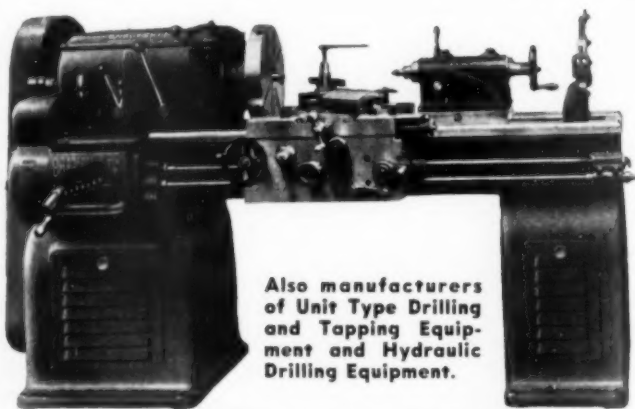
The Schenectady Chapter held its monthly meeting at the Danish Hall on November 13, with 50 members and guests present for the turkey dinner.

Chapter Chairman, Mr. Schuneman introduced the speaker of the evening, Mr. W. H. Oldacre, vice president and research engineer of the D. A. Stuart Oil Company, manufacturers of cutting oils and high pressure lubricants.

Mr. Oldacre started his talk on cutting oils and lubricants by pointing out that most manufacturing consists of the making of chips, leaving the finished product as a result. He illustrated the original theory of cutting tool action as being that in which the chip is split off ahead of the tool with a space existing between the tool and the chip. He then pointed out that the next theory advanced was

You Have PRODUCTION ASSURANCE

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Also manufacturers
of Unit Type Drilling
and Tapping Equip-
ment and Hydraulic
Drilling Equipment.

BRADFORD GEAR HEAD LATHES

NOW, more than ever before, you need lathes that will step up your production. BRADFORD LATHES give you that assurance with their twelve selective speeds—ranging from 16 to 400 RPM—producing accurate results easily and quickly! And here are some more BRADFORD LATHE features—Timken Bearings or taper bronze bearings, on high carbon steel spindle—hardened alloy steel gears running in oil—quick change gear box for selective speeds and gear cutting—push button start and stop—multi-disc clutch and brake—accurate spindle control. Write, today, and get all the facts and figures on this cost-saving, better lathe.

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of Unit Type
Drilling and
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Drilling Equip-
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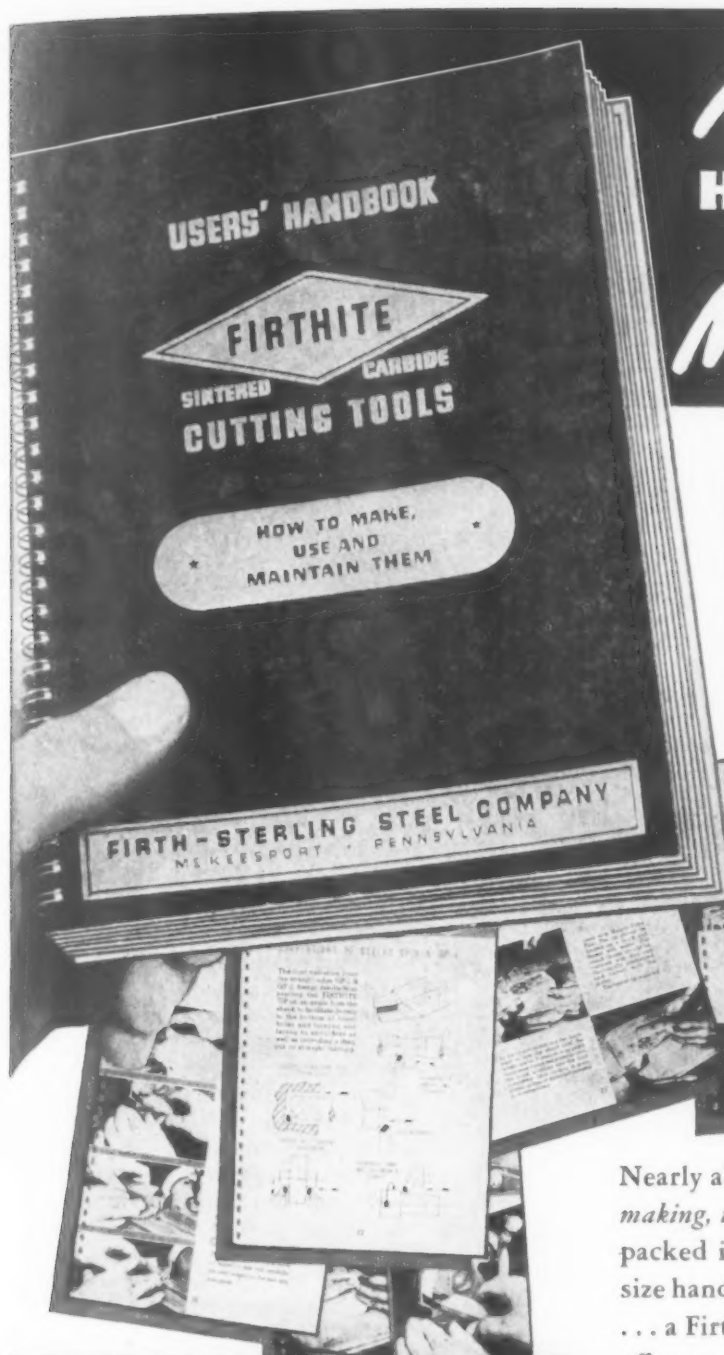


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Mr. Machinist—
HERE'S THE BOOK
Made just for YOU!

SEND FOR YOUR FREE COPY

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Please send my copy of the USER'S
 HANDBOOK OF FIRTHITE SINTERED
 CARBIDE CUTTING TOOLS to

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Nearly all the facts you need to know about the *selection, making, use, and maintenance* of Carbide Cutting Tools are packed into the pages of this 64 page, 2 color, pocket size handbook, just off the press. It's yours for the asking . . . a Firth-Sterling contribution to the National Defense effort, where practical knowledge of Carbide Tools is essential to increased production. Every machine tool operator and apprentice, tool engineer, tool room foreman, machine shop superintendent, or anyone concerned with the purchase, use and care of small tools, should have this invaluable book. A request on your company letterhead or on the coupon at the left will bring your copy by return mail. The supply is limited, so act at once.

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STEEL COMPANY

McKEESPORT, PENNSYLVANIA

that the "built-up edge" near the cutting edge of the tool was the real surface which was forcing material off ahead of the tool. He pointed out that the present theory which is that advanced by Dr. Hans Ernst of the Cincinnati Milling Machine Company, is that the chip (which is usually thicker than the depth of the cut), is produced by a series of successive shearings. Mr. Oldacre stated that the use of high cutting speeds in the machining of elastic or ductile materials is recommended because of the tendency of the material to deflect, preventing the tool from pene-

trating the material, and making it difficult to produce a clean cut. In machining ductile materials, there is a tendency for the chip to drag over the tool causing a built-up edge and requiring lubrication, whereas with brittle materials, the chips will break off free of the tool, leaving the tool clean and not requiring lubrication. He showed that most roughing chips are a combination of these two types.

Mr. Oldacre brought out the point that most cutting oils are essentially of two types: the soluble or emulsifying type and the sulphurized or chlorinated

types. In performing as a coolant, the soluble oils act principally by conducting heat away from the tool, whereas the sulphurized oils act by quenching the point or hottest part of the tool. Originally, all cutting oils were derived from fatty animal oils. As early as 1840, sulphur began to come into use, and sulphurized petroleum derivatives gradually replaced the fatty oils giving much better cutting results. The action of the sulphur in the oil prevents "scuffing" caused by welding or seizure of the material on the tool; however, Mr. Oldacre warned against the excessive use of sulphur because it sometimes causes a chemical abrasion.

A discussion period followed Mr. Oldacre's talk during which he brought out that there is a gross exaggeration of sulphurized oils being the cause of dermatitis and oil acne. This is brought out by consideration of the fact that sulphurized and chlorinated oils are excellent germicides and that in treatment of skin diseases, the medical profession will almost universally apply a salve consisting primarily of sulphur. Mr. Oldacre emphasized the fact that care and cleanliness are the most important considerations in avoiding skin troubles in the use of cutting oil.

Seattle

The Seattle Chapter held its monthly meeting on November 6 at Crawford's Grill with approximately 105 Tool Engineers and their guests present.

Mr. Fields introduced Lt. Commander Adam, U.S.N. as toastmaster. Lt. Commander Adam told of his humorous experiences in the Navy. He then introduced the principal speaker of the evening, Mr. Frank Curtis, national president of the A.S.T.E. Mr. Curtis spoke on "Tools and Tooling" along with slides. The speech included many interesting points which could be used to an advantage in the airplane industry.

Tri-Cities

Wives and lady friends of members were guests of Tri-Cities Chapter, A.S.T.E. at dinner December 3, in the Blackhawk Hotel. Students in the defense training school sponsored by the Tool Engineers and the University of Iowa, were guests for the program following the dinner.

The meeting was held in observance of the third anniversary of the local chapter which was founded December 2, 1938, when sixty-five men met to start the organization. Membership in the local chapter is now one hundred and seventy-six.

A feature exhibit at the meeting was a scale model hobbing machine built by Mr. W. W. Dickover of Barber-Col-



SPEED TREAT STEEL

.40-.50 CARBON OPEN HEARTH X1545

1. INCREASED PRODUCTION
50% to 75% Production Increases Are Not Unusual, with Savings in Costs Averaging \$37 Per Ton Used.
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3. STRENGTH
4. HEAT TREATMENT
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THANK YOU!
To friends both old and new...
thanks for your patience. We are
doing our very best for Defense
... and also for you.

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HAMMOND • INDIANAPOLIS • CHICAGO

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MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS



LOVEJOY

TYPE D

MILLING CUTTERS

PILE UP THE CHIPS—

PILE UP THE PROFITS



Watch the chips pile up when you mill with Lovejoy Cutters — and keep an eye on the cost sheet. That is where our customers find that Lovejoy Cutters make the big difference.

The Type D Mill shown here can be used singly in face widths from one to two inches inclusive, or in gangs for widths beyond two inches. Either right or left hand tooth angles are available. And Lovejoy Type D Mills have hardened steel housings and *Positively Locked*, interchangeable blades of exclusive Lovejoy design.

No matter what your milling requirements — it will pay to call on Lovejoy.



Ask for Catalog No. 26 for complete details on the modern LOVEJOY line of milling cutters.

LOVEJOY TOOL COMPANY, Inc.
SPRINGFIELD, VERMONT, U. S. A.

A. S. T. E. DOINGS

man Company, Rockford. The machine is one-sixth the size of the original Barber-Colman machine of which it is an exact replica and will cut gears up to two and one-half inches in diameter. Dickover spent two thousand six hundred and forty hours building the machine in his basement workshop.

The main program was furnished by Axel Christenson, Scandinavian philosopher.

Troy

Troy members of Chapter 20 acted as hosts in their city to the members at



Davenport Times.

Dickover's Model at Tri-Cities
After 2640 hours it was completed.

TANNEWITZ HIGH SPEED METAL CUTTING BAND SAWS

... a far Faster
Means of Cutting

TEMPLATES

from SHEET STEEL up to 1/4"

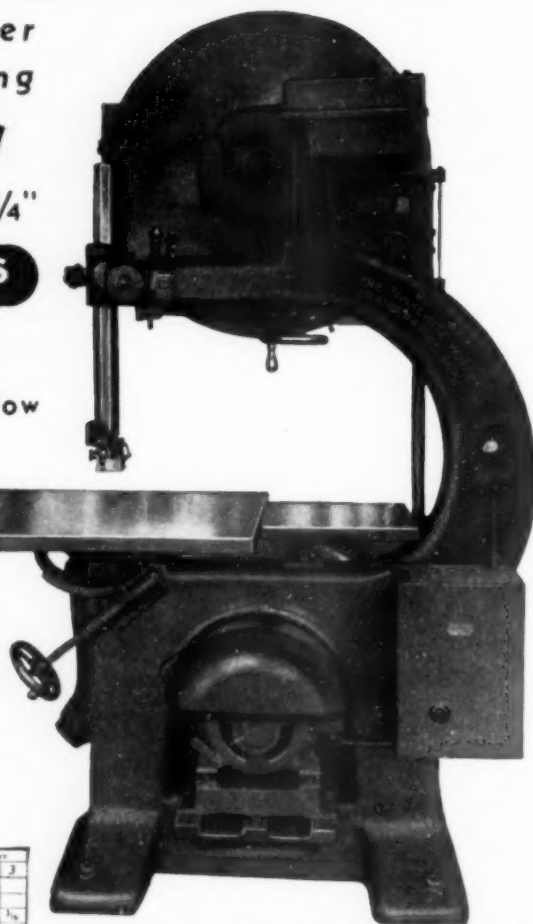
**NON-FERROUS
MATERIALS**

of all kinds up to 3"
thick — see chart below

SAVE THEIR COST IN SHORT ORDER

These superb machines, delivering over two miles of saw blade travel per minute without vibration, are doing hundreds of metal cutting jobs in a fraction of the time previously required, in metal working plants of every description throughout the country. To increase production and make important savings get the details NOW! A line requesting Metal Cutting Band Saw Bulletin will bring them to you promptly.

KIND OF MATERIAL	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"
MILD STEEL	32.08	6	3	1			
STAINLESS STEEL	6	2	1				
YELLOW BRASS ZINC	2.8	1.2	6	3	1 1/2	3/4	1/2
BRONZE OR COPPER	6	3	1 1/2	3/4	1 1/2	3/4	1/2
ALUMINUM	24.16	10	3	1 1/2	2	1 1/2	1/2
DURALUMINUM	24	12	6	3	1 1/2	1	1/2
SINGLE PLYMETAL					6	4	
DOUBLE PLYMETAL					4	3	
PLYWOOD	24.16	24	20	16	12	6	3 1/2
ASBESTOS BOARD	12	6	3	1 1/2	3/2		
FIBRE (HARD)	24	12	6	3			
PAPER BOARD	24	18	12	6	2	1 1/2	
MASONITE	24	18	12	6	3	1 1/2	3/2
BANOLITE	12	6	3	1 1/2	3/2	1 1/2	3/2



PERFECTLY SAFE: Two-wheel Lockheed Hydraulic Brakes automatically and instantly stop the wheels in case of saw blade breakage—completely guarded.

Incorporated in Tannewitz High Speed Band Saws are many highly developed, patented features found in no other band saws.

Made by Sawing Machinery Specialists

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

the December meeting. Following a dinner at the Troy Y.M.C.A., the group listened to a talk on Diesel engines by Mr. J. C. Davidson of the Engineering staff of the American Locomotive Company. Reviewing briefly the history of the Diesel engine development, Mr. Davidson pointed out that the first engine of this type was patented in Europe in 1892 and that Diesel engines were used in the United States as early as 1900. "The economy of Diesel engines," said Mr. Davidson, "is not due to the lower fuel cost but rather to improved thermal efficiency. Heat efficiencies as high as 35% are obtained in Diesel operation as compared with 15% for the conventional gasoline engine and 10% for steam engines." In comparing the Diesel with the gasoline engine, Mr. Davidson mentioned that it is usually considerably heavier and of a more rugged construction which is made necessary primarily through the use of higher pressures and its continuous operation at 100% rating.

In commenting on the application of Diesel engines to railway locomotive service, Mr. Davidson pointed out that the Diesel electric combination in which Diesel engine furnishes power to generate electric current, which in turn drives an electric motor, has been found generally more satisfactory than mechanical or fluid types of drive.

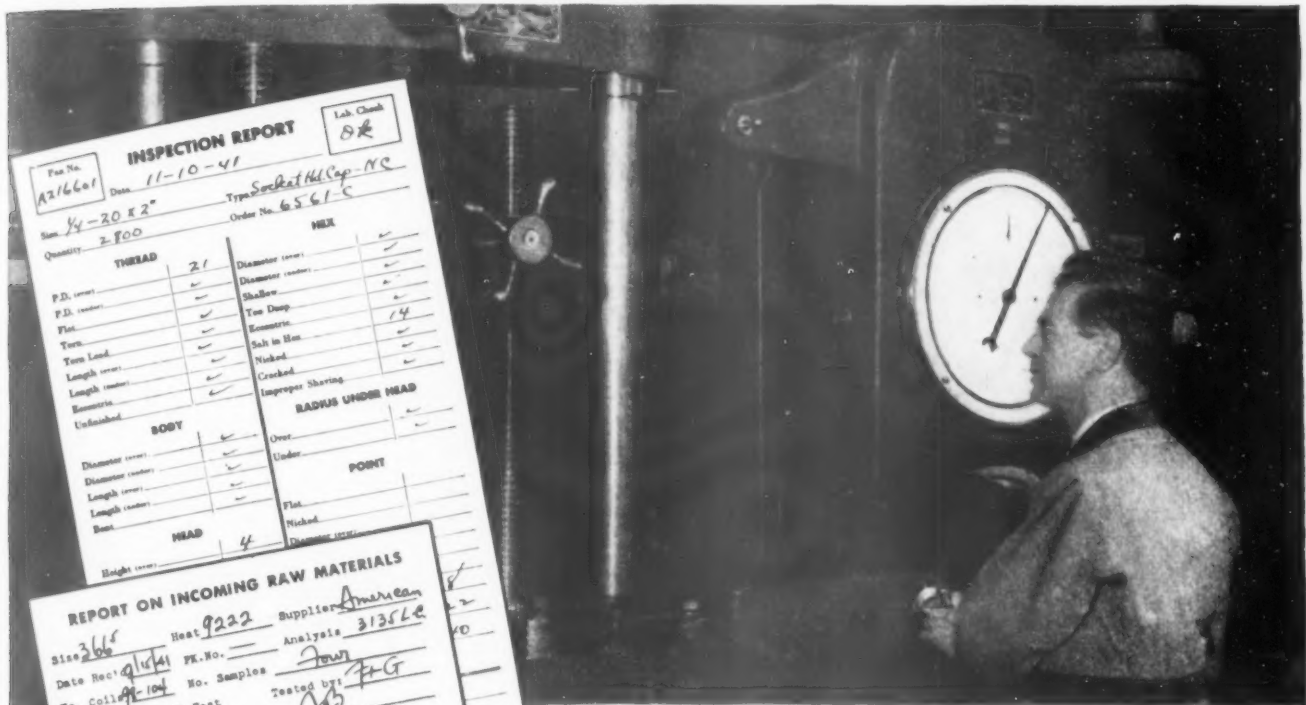
Following his talk, Mr. Davidson showed two recent technicolor movies entitled "Railroading" and "Diesel Electric Locomotives at Work in Buffalo." Both these films were produced jointly by the American Locomotive Company and the General Electric Company.

Worcester

The annual fun night was held at Putnam and Thurston's December 8, with 168 members and guests attending. The main event of the evening was the giving out of attendance prizes. There was plenty for everyone and it was said to be quite a sight to see the members leaving with incinerators, lawn rollers,

49 checks assure Dependable Uniformity

... IN THE FIRST HUNDRED OR THE MILLIONTH!



Testing tensile strength; one of 49 check-ups on P-K Socket Head Cap Screws. Actual records at left.

INSPECTION REPORT
 Form No. A216601
 Date 11-10-41
 Type Socket Hd. Cap - NC
 Order No. 6561-5
 Size 1/4"-20 X 2"
 Quantity 2800
 Lab Check OK

THREAD		BODY		HEAD		RADIUS UNDER HEAD		POINT	
P.D. (center)	21	Diameter (center)		Diameter (center)		Over		Flat	
P.D. (outer)		Diameter (outer)		Diameter (outer)		Under		Nicked	
Flt.		Length (center)		Length (center)				Discoloration	
Turn Lead		Length (outer)		Length (outer)					
Length (center)		Base							
Length (outer)									
Roundness									
Unfinished									

REPORT ON INCOMING RAW MATERIALS
 Size 3/16" Heat 9222 Supplier American
 Date Rec'd 9/16/41 P.K. No. Analysis 3135L2
 No. Coll. 104 No. Samples 7
 Metal R. Rockwell Test Tested by F+G
 Date 9/17/41 Approved by JAG
 COIL NO. 99 SIZE 3665
 Max. Tensile Load in # 8200# .206"
 Ultimate Tensile Strength in #/sq in 77,600# /sq in
 Reduction in Area % 68.5
 Rockwell "B" as Rec'd 84
 Rockwell "C" after Hardening 52
 Rockwell "C" after Tempering 42
 Structure Fine Serrit

LABORATORY REPORT
 Form No. A216601
 Date 10-7-41
 Type Socket Hd. Cap - NC
 Order No. 6561-5
 Size 1/4"-20 X 2"
 Quantity 2800
 Remarks Re. 40
 Lab Check OK
 U.S. Tensile Load - 575#
 U.S. Tensile Str. - 200,000#/sq in
 Elong. 12% in 1/2"

"Doubtful Socket Screws" are culled out by PARKER-KALON'S rigid step-by-step Quality-Control!

Parker-Kalon's Quality-Control Laboratory is your assurance that every P-K Socket Screw supplied to your assembly line is as perfect as it can be made! "Doubtful screws" - screws that look all right but some of which fail to work right - have been eliminated by a complete test and inspection routine which has no counterpart in the industry. The Parker-Kalon Laboratory controls every step in the production of these Socket Screws - beginning with a careful analysis of the special alloy steel. Physical characteristics must surpass all working requirements. Dimensions must not exceed close tolerances.

This protection against costly delays and rejects is ample reason why essential industries specify PARKER-KALON for important defense assemblies. It costs no more to get Parker-Kalon Socket Screws! Parker-Kalon Corp., 190-198 Varick Street, New York.

PARKER-KALON
Quality-Controlled
SOCKET SCREWS

Give the Green Light to Defense Assemblies



Quality-Controlled

Complete test and inspection routine covers: Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, height and concentricity; Socket shape, size, depth and concentricity; Class 3 Fit Threads; Clean-starting Threads.



onions and chickens. Musical entertainment for the evening was also provided.

Syracuse

The Syracuse Chapter held its monthly meeting on Tuesday, Dec. 9, at the Onandaga Hotel in Syracuse, N. Y. That evening at ten o'clock President Roosevelt addressed the nation by radio on the war situation. It was the day after our Government formally had declared war on Japan and the President was to make a report to the nation. Realizing the interest that this broadcast held for

everyone a radio was set up and the members at the meeting were able to hear the speech. The usual evening's program of business and technical lecture were concluded by ten o'clock.

Fifty-four members and guests attended the dinner preceding the meeting. This number was augmented by members who attended the meeting and lecture. The guest speaker was J. B. Wilkie, Gage Engineer of Pratt & Whitney, Niles-Bement-Pond Company, who spoke on gages and gaging methods.

Chairman Ray Adams proffered his

authority to vice chairman, Clayton Ainsley who conducted the meeting and introduced the speaker calling attention to the coincidence of names, Wilkie and Roosevelt, who were to make addresses.

Mr. Wilkie supplemented his talk with slides explaining thereby clearly the use of a variety of gages. He prefaced the showing of slides with remarks on the correct viewpoint in regard to gages. The fundamental purpose of gages is to prevent inaccurate parts from being produced. He emphasized the preventative value of working gages. Both the talk and slides revealed the progress which has been made in design and refinements of gages. One of the latest developments has been in the field of indicating type comparators, in electric contact gages, and in automatic gaging. A table display of Pratt & Whitney gages also had the attention of the members.

Rochester

Even with the snow and ice a sizeable number of Tool Engineers gathered around the University of Rochester's Todd Union Dinner tables Wednesday evening, December 10.

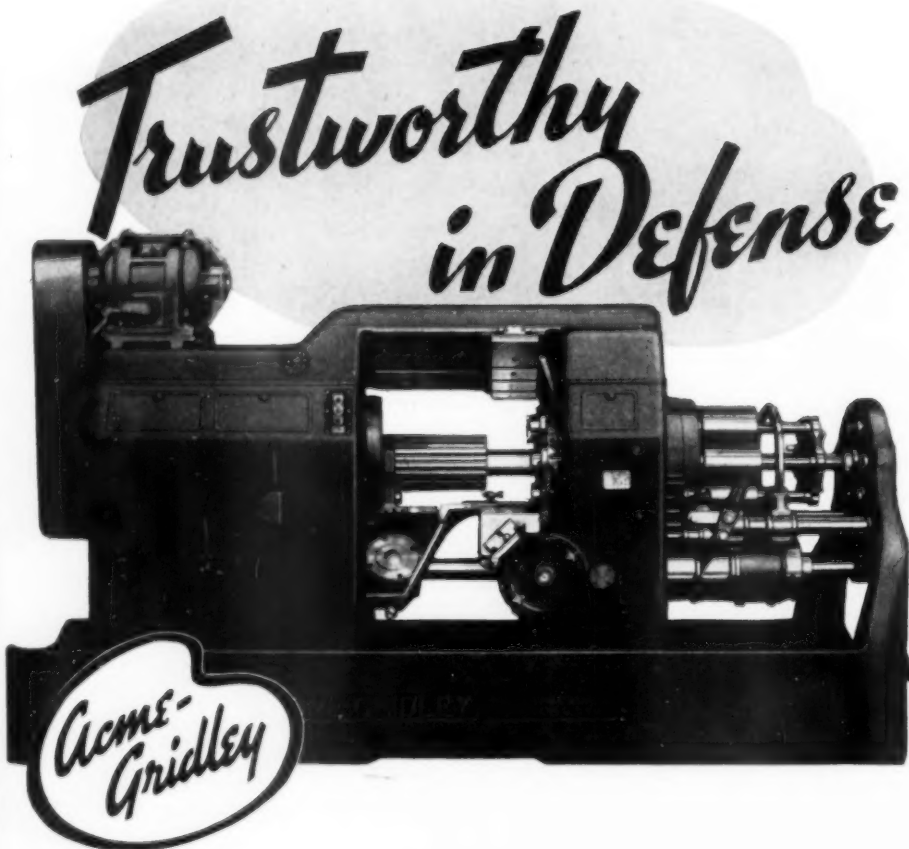
Mr. W. B. Scott, guest speaker, was introduced by Chairman C. E. Lucas. Mr. Scott opened his talk by pointing out the important place bronze takes in modern armament construction. Mr. Scott, engineer of Ampco Metal, Inc., had a color film projected showing his company's method of producing Ampco metal and various other grades of bronze alloys. The colorful pouring operations were shown by the colored film. These pictures gave a very comprehensive view of the entire Ampco set-up in respect to the manufacture of their metal.

Mr. Scott, after the completion of this film, went into his talk with the aid of slides. The speaker was thoroughly informed on not only the practical side of bronzes but the theoretical as well.

Defense Training Through Color Movies

To speed up the training of lathe operators for national defense industries, the South Bend Lathe Works, South Bend, Ind. has sponsored the production of a series of 16 mm sound motion pictures in color based on the book, "How to Run a Lathe." Practical shop methods are shown in these pictures which are available to all schools teaching machine shop work. The two reels now complete are 800 ft. each and have a 40 minute showing time. Write dept. T7 for complete information.

THE TOOL ENGINEER



Operate multiple spindle Bar or Chucking Automatics on a 24-hour Defense schedule, push them to the limit of speeds and feeds that tools will safely stand—then you find out how trustworthy they are.

Under just such gruelling conditions, in arsenals and among suppliers of billions of Defense parts, hundreds yes, thousands of Acme-Gridley automatics will continue trustworthy for "the duration" and years after—

Because Acme-Gridley design factors that insure accuracy and stamina were thought out and PROVED out far in advance of today's emergency needs.

NATIONAL ACME

170 EAST 131ST STREET • CLEVELAND, O.

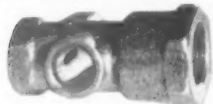
ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING

The **SUNNEN** PRECISION HONING MACHINE

is Helping to Speed Up DEFENSE PRODUCTION by Handling Jobs Like These FASTER, More ACCURATELY



Drawing and Blanking Die "Saves time in producing smooth base metal finish."
Inner Bearing Ring "Accurately removes last 'tenth' of stock."



Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



Molded Composition (Bakelite) Pulleys. Molded composition is a difficult material to machine but it can be easily honed to a smooth finish.



Stone Lettering Air Hammer "Sunnen honing does in five minutes what it took 20 minutes to do by lapping."



"Produced an extremely accurate and glass-like finish."



Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."



Bushings for Automatic Drinking Fountain "Saves buying new expensive production equipment."



Drill Jig Bushing "Increases sales appeal of product."



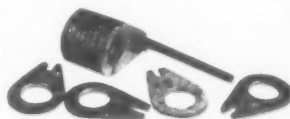
"Strict alignment maintained between two holes."



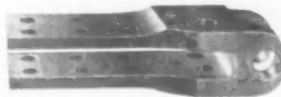
Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface finish is secured.



Honing was used to correct errors of previous machining operations and to obtain a highly-polished surface finish.



Hardened Steel Parts. Honing is used to remove burrs caused by the flash of a punch press operation.



Mild Steel Clevis. Honing was used to correct errors of previous machining and maintain true alignment of the two bearing surfaces of this clevis.



Hardened Steel Gears. Honing used to remove any distortion after hardening and to selectively size the gears to uniform diameters.



Miniature Model Airplane Cylinders "Eliminates expensive machine set-up."



Taper removed at a rate of 80-90 per hour from automobile distributor shaft gears.



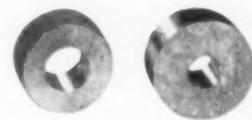
Better finish and alignment maintained on yoke for compressor



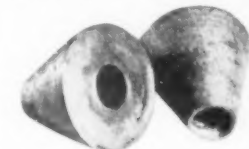
Aluminum Aircraft Link "produces high finish without bell-mouthing"



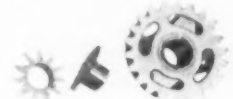
Hardened Steel Inner Bearing Race honed to .00005" limit. Surface finish improved, errors of out-of-roundness eliminated.
Aircraft Valve Tappet Roller. 4-Micro finish.



Hardened Steel Ring Gauge—finished to an accuracy of .000025" for roundness and straightness.
Compressor roller "maintains .00005" limit, increased production over 100%."



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."



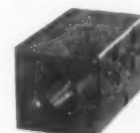
Sunnen honing corrected distortion caused by hardening for manufacturer of small parts.



Crankshaft Grinder Bracket "Replaces expensive machine set-up for short-run production"



Airplane Engine Parts accurately honed to a super-smooth finish.



Saved time in producing a smooth accurate finish on this bronze remote control valve body



Grinds and finishes internal cylindrical surfaces from .185" to 2.400" with guaranteed accuracy of .0001". Relieves big internal grinders. Does not require skilled labor! Can be set up in less than a minute. Is saving money, increasing production and improving quality for hundreds of manufacturers handling important defense orders.



SUNNEN PRODUCTS CO.

7932 Manchester Ave., St. Louis. Detroit Office: 321 N. Lafayette Blvd.
Canadian Factory: Chatham, Ontario

Write for FREE 8-Page Bulletin

giving complete information or, if you prefer, a Sales Engineer will be glad to call with his demonstrator and show you what this machine can do on your job.



NEW LITERATURE

Of Interest to the Tool Engineer



(329) Thread Grinding

A Handbook on Thread Grinding. 24 pp. Norton Company, Worcester, Mass. This booklet has been compiled from experiences encountered while selecting the best wheels and trying to establish the best operating conditions for thread grinding jobs. The rules contained will be especially helpful to operators new to thread grinding machines. Pages are

provided at the back of the book where data on difficult jobs can be recorded.

(330) Millers

Production Milling Machines. 8 pp. The Ohio Machine Tool Company, Kenton, Ohio. This bulletin gives the complete description of the Ohio Miller and details of its construction with illustrations. Also included in chart form are

the complete specifications of the miller.

(331) Identification

Matthews Checks and Badges. 23 pp. Jas. H. Matthews & Co., 3942 Forbes Street, Pittsburgh, Pa. This catalog lists and illustrates the many types of checks and badges available for tool checks, time and pay checks and employees badges for positive identification. Suggestions are also given as to what lettering to put on them.

(332) Shipping Losses

How to Prevent Lost Shipments. 11 pp. Jas. H. Matthews & Co., 3942 Forbes Street, Pittsburgh, Pa. Not only does this catalog list the various types of metal shipping tags and their uses, but also lists and illustrates the embossing machinery for use in your factory with blank tags. Many helpful suggestions for shipping protection are found in this catalog.

(333) Product Marking

How to Mark Your Products. 19 pp. Jas. H. Matthews & Co., 3942 Forbes Street, Pittsburgh, Pa. Throughout this catalog, a wide variety of steel marking dies, steel type, type holders, marking machines and special marking devices are described and illustrated. It is as complete as possible to aid you in your product marking problems.

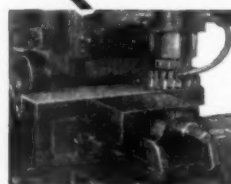
(334) Steel

Jessop Lion Carbon Tool Steel. 7 pp. Jessop Steel Company, Washington, Pa. Instructions on the application of carbon tool steel in hot working and heat

FOUR-IN-ONE!



LIGHT MILLING



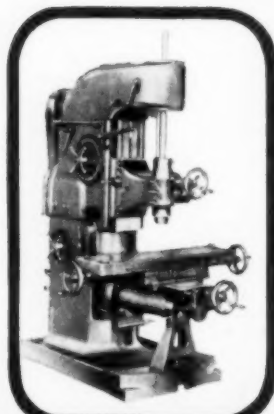
FACE MILLING



BORING OPERATION



HEAVY MILLING



KNIGHT MILLER

The production of four Milling Machines all in one—that's the KNIGHT MILLER! Versatile because it does light and heavy milling, facing and boring—yet accurate to the thousandths in every operation! The KNIGHT MILLER is in line with Defense for it produces MORE WORK, requires LESS EQUIPMENT, eliminates HOURS OF LAYOUT TIME, while it produces the HIGHEST QUALITY RESULTS!

WRITE TODAY FOR A NEW CATALOG

W. B. KNIGHT MACHINERY CO.
3920 WEST PINE
SAINT LOUIS, MO.

HOW TO ORDER

Booklets listed in this department and identified by a key number preceding the heading may be obtained by using the postcard on page 101. No postage is required.

treatment, forging, annealing, hardening, tempering and tool design are included in this booklet along with illustrated graphs.

(335) Bushings, Bearings

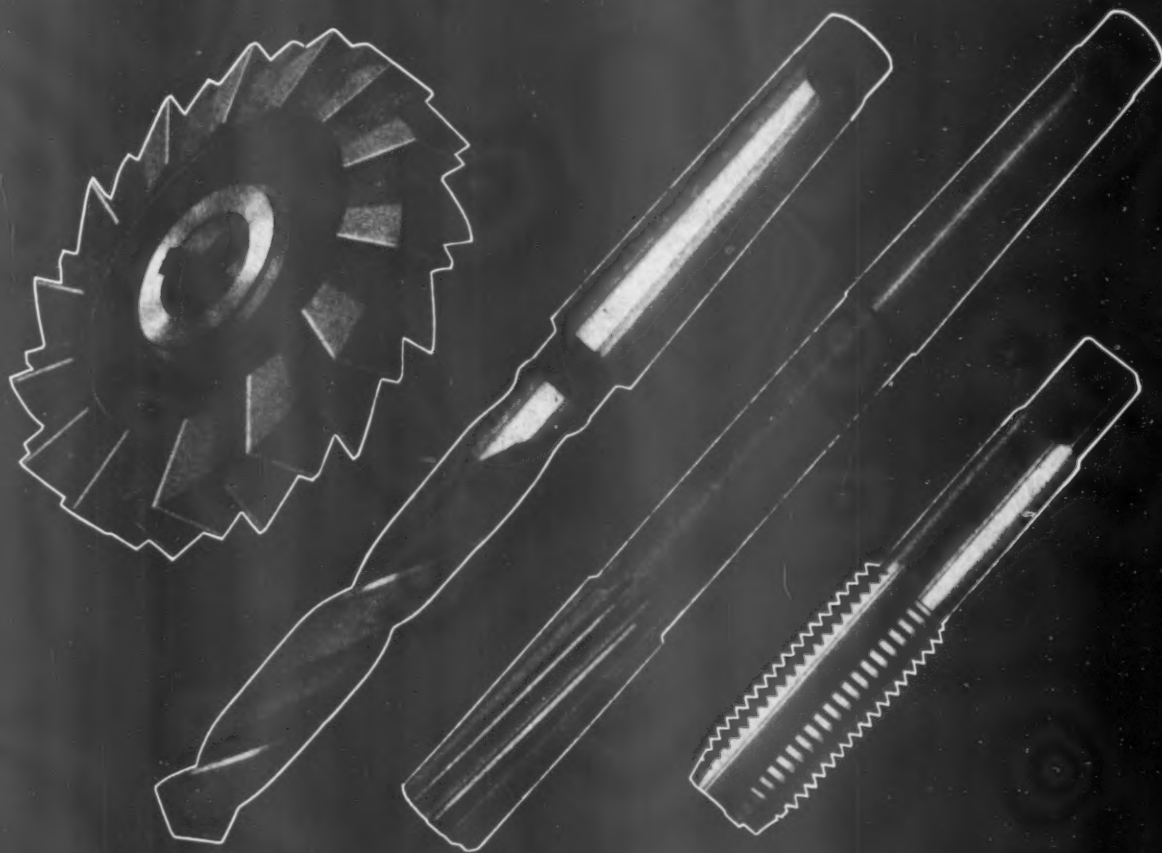
Ampco Metal in Bushings and Bearings. 6 pp. Ampco Metal Inc., 1748 South 38th Street, Milwaukee, Wisconsin. This folder contains a discussion of the advantages of using the parts made from Ampco metal. Case histories are cited to point out the merits of the bronze in actual service. Illustrations of typical parts are included in the folder.

THE TOOL ENGINEER



... AND KEEP 'EM TURNING!

Hour after hour, shift after shift,
24 hours a day — quality tools
prove their worth at the work-
heads by keeping vital defense
production on the move.



MORSE

**THERE IS A
DIFFERENCE**

**TWIST DRILL AND
MACHINE COMPANY**
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

(336) Cutting Tools

Standard Carbide Tools Stock Sizes. 4 pp. Tungsten-Carbide Tool Company, 7171 McNichols Road, Detroit. Covering a new line of "standard" cutting tools, a new bulletin has just been released with complete specifications for 92 different types and sizes of carbide tools and their prices. Both steel-cutting and cast iron and non-ferrous cutting tool grades are given.

(337) Surface Plates

Precision Surface Plates, Angles and Cubes. 4 pp. Machine Products Cor-

poration, 6771 East McNichols Road, Detroit. This folder not only quotes prices, sizes and specifications, but also gives illustrations and descriptions of surface plates, angle plates, slotted angles, universal angles, box parallels or cubes, measuring angles and tool makers knees. Also listed and illustrated are knobs, wheels and handles.

(338) Machinery Cleaning

Stop Machinery Wear. 4 pp. Ideal Commutator Dresser Company, 1274 Park Avenue, Sycamore, Illinois. Portable cleaners and the various methods

of cleaning machines are described by this mailing piece. It is accompanied by a list and specifications of the different models and illustrations including the various attachments.

(339) Castings

Meehanite Castings in Defense Work. 12 pp. Meehanite Research Institute of America, Inc., 311 Ross Street, Pittsburgh. This bulletin describes and illustrates Meehanite castings and how they are used in aircraft manufacture, gun and shell manufacture, machine tool castings, and radio, marine, truck, and steel mill equipment.

(340) Electrical Equipment

Quick Selector Catalog. 60 pp. Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. This catalog is issued twice a year to simplify the selection of electrical equipment for any motor, lighting or feeder circuit. The six sections of the catalog feature safety switches, nofuse breakers, nofuse multibreakers, panelboards, motors and motor control.

(341) Lubrication

Gits Oilers, Oil Seals, Lubricating Devices. 172 pp. Gits Bros. Mfg. Co., Chicago. This catalog is in the form of a manual on lubrication for engineers. Information is given on the proper selection and use of lubricating devices. Special sections are devoted to wick feed oiling, constant level oiling and multiple oiling. In addition, oil cups, hole covers, gauges and sight gravity oilers are featured.

(342) Conveyors

Labor Saver. 22 pp. Stephens-Adamson Mfg. Co., Aurora, Illinois. This periodical magazine contains the latest available information on new material handling designs and problems. It features stories and illustrations of various concerns who have solved their problems of conveying, elevating, screening and transmission equipment.

We've got a
WAR TO WIN!



Get CAPACITY production from every machine—with

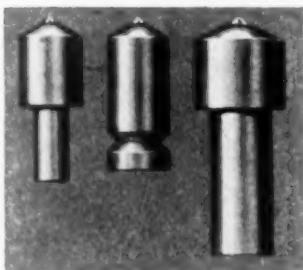


DIAMOND TOOLS



Above:
Shaped Cutting
Tools for Turning,
Boring, Facing.

Right:
Landis Nib, Norton
Nib, Cincinnati Nib
for truing and
shaping emery
wheels.



With America at war, industry **MUST** get more capacity out of every machine—squeeze more production out of every minute! "Asco" Diamond Tools are making this possible in turning, boring, facing and truing operations throughout the armament plants.

"Asco" Diamond Tools permit precision cutting at much higher speeds on toughest metals, alloys, compositions and abrasive materials. Their surpassing hardness and durability give more cuts per tool—hold close tolerances for extremely long periods. Grinding and re-tooling time is saved, interruptions reduced. The smooth finish produced often eliminates subsequent polishing. Prompt shipment can be made on all "Asco" Diamond Tools—also Bortz, Ballas and Carbons in all sizes and grades. Send blueprints of special shaped tools for quotation. Write for detailed folder.

Also DIAMOND DIES, CORE BITS, VALVE REFACERS, PHONO POINTS, WRITING PENCILS, ETC.

ANTON SMIT & CO., INC.

LEONARD J. A. SMIT, Managing Director

24 STATE STREET - - - NEW YORK, N. Y.

TELEPHONE: BOWLING GREEN 9-0616

IMPORTERS OF INDUSTRIAL DIAMONDS—BORTZ, CARBONS AND BALLAS.
MANUFACTURERS OF ALL KINDS OF DIAMOND TOOLS.

— NEW BOOKS —

Audel's Machinists and Tool Makers Handy Book by Frank D. Graham. 1578 pp. \$4. Theo. Audel & Co., Publishers, 49 W. 23rd St., New York. The purpose of this book is to provide a complete course of study for those desiring to become machinists, and to help machinists become tool makers.

A progressive method of presentation has been followed with each machine being explained as to how it works, its actual construction, and the machining operations. This completely illustrated book has five sections and is cross indexed as to subject matter and chapter headings.

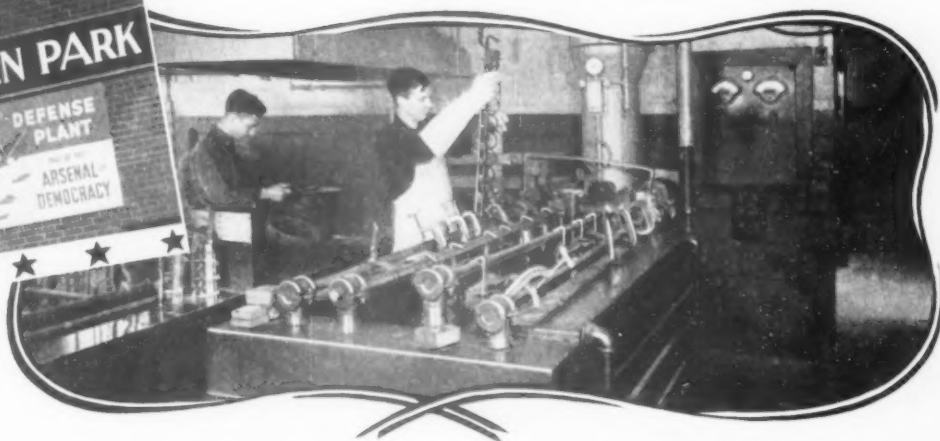
No. 8 IN THE SERIES OF LINCOLN PARK *First*

Hard Chromium Plating

Makes possible •

MORE GAGES

for Defense Production



With the steady increase in Defense Production, salvaging by hard chromium plating of gages and non-cutting precision tools has gained proportionately in importance. By restoring thousands of gages to original or other specified tolerances, definite economies have been effected. Of greater significance, however, these gages are being put back in service at a time when their replacement with new ones could be long delayed, and when they are vitally needed for immediate inspection use.

Lincoln Park's plating department was in operation for several years before the present emergency. It was set up at a time when the best of equipment and personnel were available. Careful at-

tention was given then — as it is now — to proper preparation before plating. Methods of plating best suited to the precision machining to follow were developed. During this time, too, special grinding operations such as those required in chrome plating and salvaging thread gages were handled successfully.

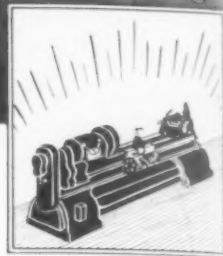
Lincoln Park was fully prepared to swing its hard chromium plating facilities and salvaging experience into filling the needs of customers engaged in Defense Production. Today, gages salvaged by this company are in use for the inspection of hundreds of vital armament parts. With constant efforts being made to widen the scope of this work, Lincoln Park will be equally as well prepared to meet the requirements of the future.



LINCOLN PARK TOOL and GAGE CO.

LINCOLN PARK, MICHIGAN

NEW EQUIPMENT, Materials, Processing



MOREY-SHIELDS THREAD MILLING MACHINES

(F92)

A new thread milling machine said to combine precision thread milling with simplicity and ease of operation has been announced by the Morey Machinery Co., Inc., 410 Broome Street, New York.

These machines, internal and external, are built in one swing and three standard bed lengths, 30, 60 and 90 inches between centers for single cutter or multiple hob milling.

Right or left hand single threads, right or left hand multiple threads are claimed to be cut with accuracy, speed and economy.

Features of the machine include simplicity of varying and selecting the speeds and feeds, extra heavy rigid bed section and motor driven cutter head, fully universal with four self-contained gear changes.

Deep hole drilling differs from conventional drilling in that the work-piece is revolved and fed over a stationary drill. The drill consists of a high-speed steel tip attached to a long tubular steel shank. It is claimed that rapid chip disposal results from this construction and facilitates high production.

Tailstock and headstock are coupled by adjustable tie-bars on either side. This provides a saddle with bearing surface four feet longer than length of work-piece and insures a solid footing for the tailstock. The tool holder is mounted permanently on one end of the machine base. Both spindles are rotated and fed simultaneously.

The self-contained hydraulic head weighs approximately 4000 pounds, and is actuated by a large diameter cylinder. This massive construction is said to permit smooth drilling at heavy feeds.

Spindles and hydraulic pumps are driven by the same motor. This feature insures a constant feed per revolution regardless of fluctuation in motor speed due to variance in loads.

BARNES DRILLING AND BORING MACHINE

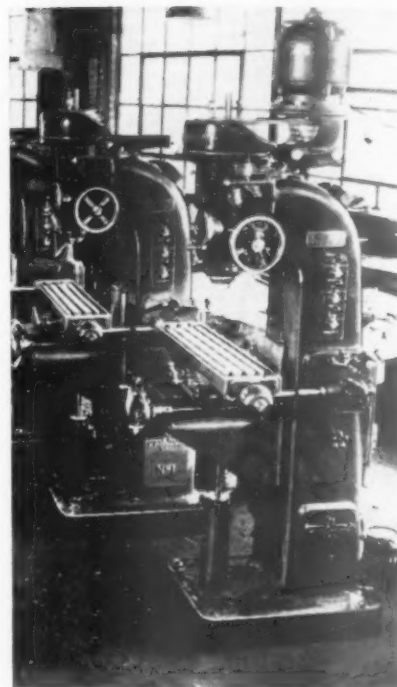
(F93)

With the announcement of a two spindle drilling and boring machine for medium calibre guns by the W. F. and John Barnes Company, Rockford, Ill., comes the report of better results in deep hole drilling and boring from its use.

CLEVELAND NO. 1 VERTICAL MILLING MACHINE

(F94)

To meet the steadily growing demand for a small, rigid, high-speed vertical spindle milling machine the Sommer & Adams Company, Cleveland has de-



Cleveland Milling Machine
The operation is sensitive.

signed a machine which embodies all essential features required by the modern Tool Room.

The vertical spindle is of chrome nickel steel, heat treated and accurately ground, and is mounted in a quill on pre-loaded precision ball bearings, counter-balanced by a weight suspended in the column.

The slides on the column, knee, saddle and table are accurately scraped to provide the degree of accuracy required.

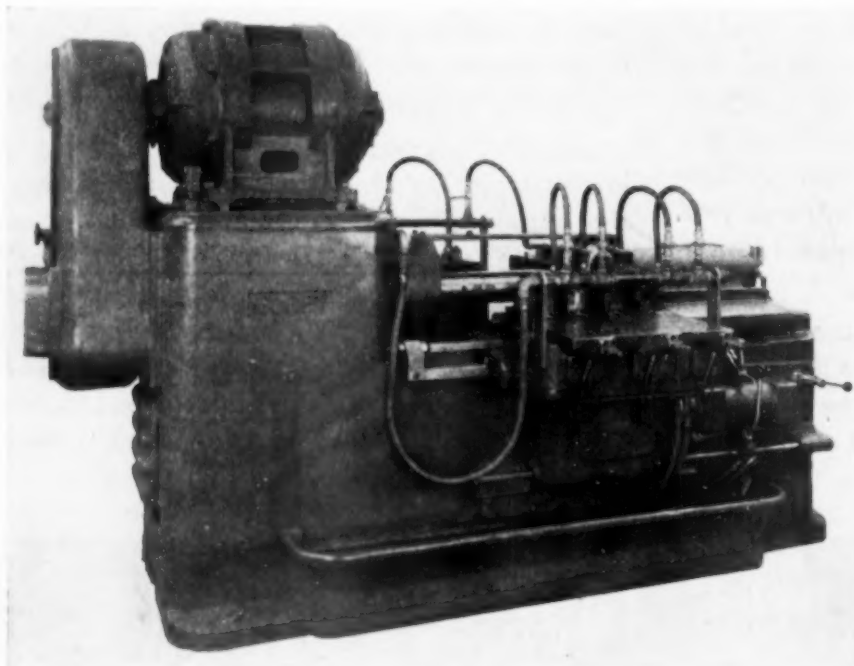
Twelve automatic longitudinal feeds ranging from 6 inches to 12½ inches per minute is a feature of the table. The gears in the feed box are made of heat treated alloy steel and are carried on spline shafts which are mounted on Timken roller bearings.

The machine is said to be more sensitive in operation particularly when using small mills because the cross feed screw and the table screw are mounted on double row Timken bearings, allowing free movement.

OZALID WHITEPRINT MACHINE

(F95)

Especially designed to meet industry's heaviest print making demands, the new model B Whiteprint machine announced by the Ozalid Products Division, General Aniline & Film Corporation, Johnson City, New York, is said to



Morey Thread Milling Machines
The speeds and feeds are simple to select.

FREE INFORMATION and SERVICE

Request the information and service you desire and keep your library up-to-date...

THREE FREE SERVICES... WITHOUT OBLIGATION

For your convenience, these three business reply cards enable you to request quickly...

1 New catalogs—bulletins listed in this issue.

2 Additional information or bulletins relative to new equipment—new materials or new processes.

3 When answering advertisements, specific information on problems or company representative's call.

HOW TO ORDER

Simply fill out the card, indicating the information or service you desire, and mail. Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described. In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.



USE THIS CARD for requesting new catalogs and bulletins listed in this issue.



USE THIS CARD for requesting additional information or bulletins relative to new equipment, materials, processes, etc.



USE THIS CARD when answering advertisements, to obtain specific information on problems or when you desire a company representative to call.

Write in square, number of item describing one catalog wanted →

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TITLE

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THE TOOL ENGINEER

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They are provided for your convenience in requesting information and service

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2c.-POSTAGE WILL BE PAID BY—

THE TOOL ENGINEER

THE BRAMSON PUBLISHING COMPANY

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DETROIT, MICH.



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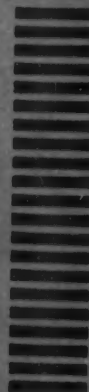
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DETROIT, MICH.



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**NEW EQUIPMENT
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PROCESSES**

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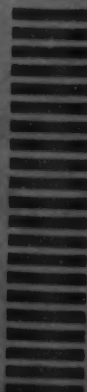
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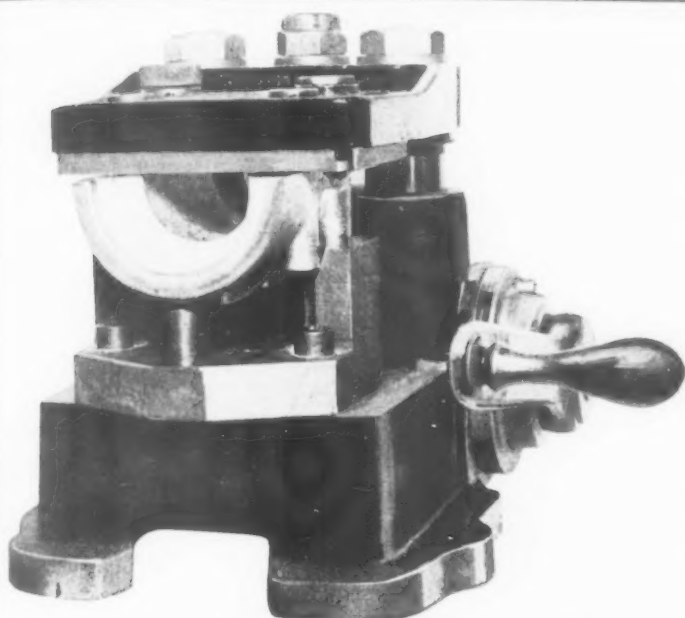
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**ANSWERING
ADVERTISEMENTS**

Requesting :

**LITERATURE
REPRESENTATIVE
TO CALL**



TOOLING ECONOMY

SIMPLE ADAPTERS CAN BE USED TO
HOLD COMPLICATED PARTS WHILE
MACHINING

**THE FIXTURE ITSELF NEVER
BECOMES OBSOLETE**

An aeroplane main bearing cap is shown,
chucked ready to drill 6 bolt holes. Part is
positioned from four bosses in lower adapter
and squared and clamped on finished face by
fixture head.

SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley

ASK FOR CATALOG 238

Detroit, Michigan

Represented by

Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Houston—Engineering Sales Co.

Chicago—Ernie Johnson
Canada—Hi-Speed Tools, Ltd., Galt, Ont.
St. Louis—Mill Supply & Mach. Co.
Beverly Hills, Cal.—Criterion Tool Sales
Oneida, N. Y.—W. F. Himmelsbach

Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool
& Equipment Co.



**MULTIPLE
POINT
AND
SINGLE
POINT**

**GRINDING WHEEL DRESSERS
WITH DIAMONDS**

SET IN SINTERED TUNGSTEN CARBIDE

ASK FOR NEW 16 PAGE DESCRIPTIVE BOOKLET AND PRICE LIST

DIA-TOOL INC.

320 YONKERS AVENUE,

YONKERS, N. Y.

be capable of producing finished whiteprints at speeds up to 20' per minute.

Combining printer and developer in one compact unit, this newest Ozalid Whiteprint machine includes such added features as synchronized printing and developing which permits the use of continuous yardage as well as cut sheets, a temperature control for the printing cylinder so that the entire range of Ozalid sensitized materials can be printed with maximum results and a special light placed above the print receiving tray enabling the operator to

check the prints when they are delivered at the rear of the machine.

The machine also has an adjustable burner shade to permit running prints of varying opacity without changing the printing speeds, an automatic air pick-off and a blower hook-up.

"STEDIFLO" (F96) VARIABLE DELIVERY PUMP

A pump, especially suited to hydraulic press applications where a rapid advance must be followed by a slow movement at high pressure and for boiler

feed where sudden changes in output affecting the water level are met, has been built by the Watson-Stillman Co., Roselle, N. J.

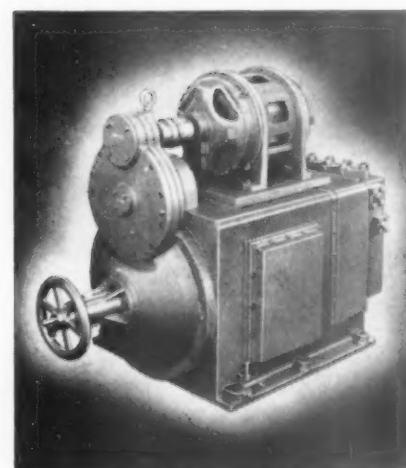
This new, variable delivery, high pressure pump is a development of the



Whiteprint Machine
Produced at 20 ft. per minute.

company's line of "Stediflo" Pumps, new in that the flow is said to be infinitely variable from 0 to 6 gpm at 5000 lbs per square inch pressure. This is accomplished by a new driving member trunnioned on the drive shaft; its angle can be varied while the pump is running to produce a corresponding stepless change in plunger stroke from 0 to full 4 inch stroke.

The stroke control shaft is extended to the outside of the pump casing for at-



Variable Delivery Pump
Especially for hydraulic presses.

tachment either to a manual or automatic pressure control.

The pump is equipped with a 25 hp motor, mounted in a way that the entire unit requires only 4' x 4' of floor space. Weight is 5000 lbs. It is possible for units to be built for designed pressures ranging from a few hundred to eight or ten thousand lbs per square inch pressure.

DESIGNED TO PROTECT BORING ACCURACY

McCROSKY

Adjustable Boring Blocks and Bars



WHEN the defense job you are tooling includes holes to be bored with extreme accuracy, investigate the advantages of the McCrosky Centralizing-V Lock. It centers the Adjustable Block in the bar with extreme accuracy and also provides close control of the amount of block float for the finishing cut. And it permits blocks to be inter-changed without removing the centering key from the bar... For complete details ask for McCrosky Bulletin 15-B.

McCROSKY TOOL CORPORATION

MEADVILLE

PENNSYLVANIA

COAT
CUTTING
BLOCK

SUPER ADJUSTABLE REAMERS
JACK-LOCK MILLING CUTTERS
WIZARD QUICK-CHANGE CHUCKS

ADJUSTABLE BLOCK BORING BARS
SPECIAL PURPOSE TOOLS
McCROSKY TURRET TOOL POSTS

. . . that it did not ring in vain



"Man has found that he must give liberty to others in order to have it himself"

Every detail in directing and handling Defense orders for rebuilt and reconditioned tools is protected by the use of methods which guard against delays, mistakes and waste.

These methods, continuously developed for better service to industry for nearly a third of a century, are proving of great importance in our present struggle to preserve liberty for the people of the United States of America.

As Defense production gains momentum the history of the Liberty Bell takes on greater significance.



EASTERN CUTTER SALVAGE CORPORATION, 30-32 LITTLETON AVE., NEWARK, N. J.
Western Plant MASTER TOOL CO., INC., 5605 HERMAN AVE., N. W. CLEVELAND, OHIO
Chrome Plant MASTER CHROME SERVICE, INC., 5709 HERMAN AVE., N. W., CLEVELAND, OHIO

REEVES MACHINE TOOL DRIVE (F97)

A motorized variable speed drive for machine tools which is said to eliminate the necessity of building a special support or bracket in mounting Reeves variable speed control units has been announced by the Reeves Pulley Co., Columbus, Indiana.

This drive utilizes either the Reeves Vari-Speed Motodrive or the counter-shaft type Vari-Speed Motor Pulley. It comprises a symmetrical, compact as-

sembly of constant speed driving motor, variable speed unit and mounting bracket which can easily and quickly be attached to most machine tools by four cap screws.

Smooth, quiet, vibrationless transmission of power from drive to driven machine is claimed and any speed at all within the limits of the particular unit applied may be instantly obtained by turning a handwheel without stopping the driven machine.

Motor and variable speed unit are mounted on a pivoting base at the top of a cast semi-steel bracket. Proper belt

tension is uniformly maintained by a lock screw.

Two sizes of bracket are available. With the Motodrive, capacities are from 1/4 to 10 hp. and speed ratios from 2:1

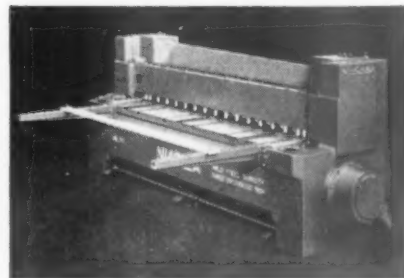


Reeves Machine Tool Drive
Quickly attached to most machines.

through 6:1 are available. Using the Vari-Speed Motor Pulley, capacities range from 3/4 to 7 1/2 hp. and cover speed ranges of either 2 3/4:1 or 3:1 ratio.

NIAGARA POWER SQUARING SHEARS (F98)

More working strokes per hour are said to be possible, with the new power squaring shears which have been added as Series No. 7 to the line of the Niagara Machine & Tool Works, Buffalo, N. Y. Built in 4 to 12 foot cutting lengths with capacities from 1/4 inch to 10 gage, these shears are of underdrive design with drive including flywheel, gearing, clutch, eccentrics and connections completely



Power Squaring Shears
A new degree of accuracy.

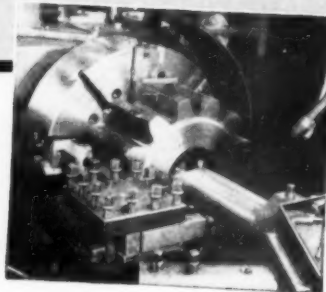
enclosed and operating in a bath of oil. A new degree of accuracy is claimed by their advanced design, which provides straight shearing to within a few thousandths of an inch without camber or curl. It has a high operating speed

THE TOOL ENGINEER

Interrupted Cuts

NEED NOT WORRY YOU

IF YOU USE
KENAMETAL
The *Stronger*
STEEL-CUTTING CARBIDE



NOT so very long ago, tool engineers hesitated to use carbide tools on any job which savored of interrupted cuts. The introduction of KENAMETAL, however, completely reversed their opinion, for the greater strength and elasticity of KENAMETAL with suitable tool angles permitted its use on interrupted or jump cuts without tool breakage. In the job illustrated, for example, a cast steel rack pinion is turned, faced, and bored over interruptions and sand holes at 155 ft. per min. using KENAMETAL grade KM tools. Production was increased 5 to 1 as compared to high speed steel tools.

If you have a steel-cutting job involving interrupted or jump cuts, you can be sure of long tool life by specifying properly designed KENAMETAL-tipped tools. Details are given in Catalog No. 42 — write for your copy.

COMPARE THESE DELIVERY DATES

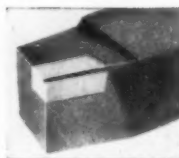
Standard Tools10 days
Modified Standard	
Tools10 days
Blanks2 to 4 days
(upon receipt of order)	

"LARGEST MANUFACTURER OF STEEL-CUTTING CARBIDE TOOLS"

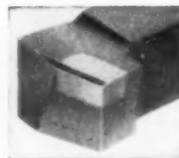


Foreign Sales: U.S. STEEL EXPORT CO., 30 Church St., New York
(Exclusive of Canada and United States)

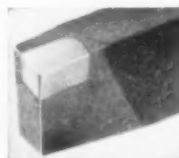
Canadian Agent: KENAMETAL TOOLS & MFG. CO., LTD., Hamilton, Ont.



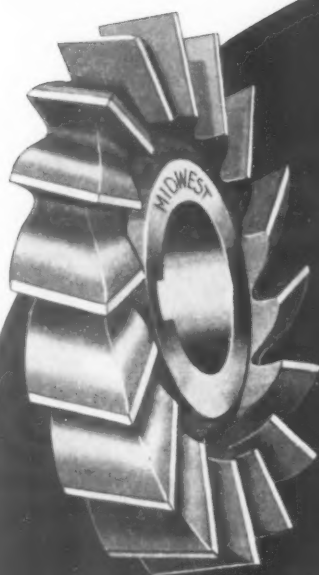
STYLE 11
TURNING TOOL



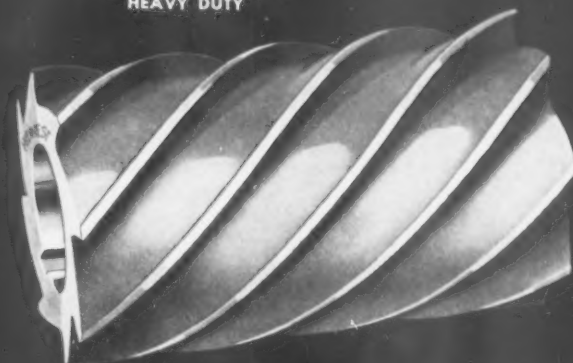
STYLE 21
FACING TOOL



STYLE 19
SHAPER TOOL



PLAIN MILLING CUTTER
HEAVY DUTY



HALF SIDE
MILLING CUTTER



STAGGERED TOOTH
SIDE MILLING CUTTER

MIDWEST MILLING CUTTERS AND HOW BEST TO USE THEM

HEAVY DUTY PLAIN MILLING CUTTERS—This type of cutter is recommended where there is heavy production milling of materials in soft or alloy steel, bronze or copper. They have coarse pitch, undercut teeth with maximum backing behind cutting edges and ample chip space.

Midwest standard heavy duty mills have a smooth cutting action; they set up an end thrust which keeps the spindle tight in its bearings and eliminates chatter because they are made with 45° left-hand spiral teeth.

HALF SIDE MILLING CUTTERS—a type for heavy-duty straddle milling operations where only one side of the cutter is required for milling; also used frequently in pairs to mill a slot to fixed width but where finish at bottom is not important.

These mills have spiral, undercut teeth which provide particularly free-cutting action. Compared with side milling cutters, these half side mills show lower power consumption, more pieces per grind, and less idle machine time due to cutter changes.

STAGGERED TOOTH SIDE MILLING CUTTERS—This type of mill is exceptionally free cutting. For that reason it is ideal for deep slotting or the milling of keyways. The top teeth are undercut and have an alternate right and left-hand helix angle, which greatly reduces end thrust.

Since drag ends (inefficient tooth portions) are eliminated, increased chip room is obtained, and chip lengths are broken up, giving them the characteristic snap out of the cut. The sides of the teeth having no cutting action are "dished"



slightly toward the recessed part of the cutter and this eliminates "bugging" of the cutter sides and, in turn, scoring the sides of the slot.

Many other types and forms of metal cutting tools are made by Midwest; catalog No. 17 contains illustrations and extensive information on them.

Any metal cutting problem inquiry you make will be carefully studied and analyzed. Suggestions and recommendations will be returned to you on types of tools to employ and how best to use them—a Midwest service entering its 31st year.

MIDWEST TOOL & MFG. CO.
2364 W. Jefferson Ave. Detroit, Mich.



END MILLS • SLEEVES • COUNTERBORES • DRILLS
SPECIAL TOOLS • REAMERS • FORM TOOLS
CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS



Precision METAL CUTTING TOOLS

of 60 strokes per minute combined with convenient, safe handling of stock and off-cut material.

Standard equipment includes self-measuring, ball bearing parallel back gage adjustable to increments of 1/128 inch, front gage with front brackets and side and bevel gages.

KELEKET X-RAY MACHINES

(F99)

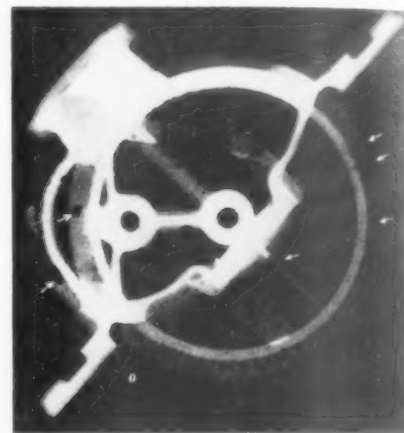
The application of X-rays in industry has grown enormously in the last few

years as evidenced by an announcement of the Kelley-Koett Mfg. Co., Inc., Covington, Kentucky that states a new concept of the usefulness of the X-ray.

Films are no longer made with the negative idea of rejecting work already done, but with the positive, constructive idea of improving manufacturing processes so that the cause of the defects will be eliminated. In the past however, the X-ray was used to detect flaws in the finished product. Now the idea is to detect the flaws in the raw materials.

X-ray equipment at the time of the last World War was very bulky. Ex-

posed high voltage lines offered a constant menace to the operator, and a great deal of stray energy emanated from the tubes. Tremendous strides in



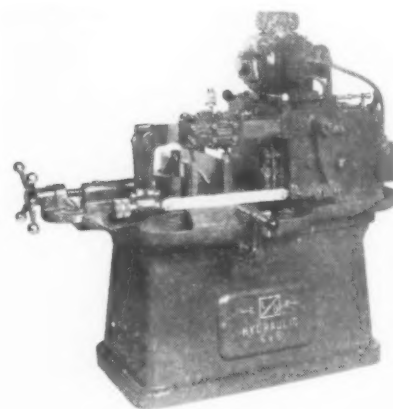
X-Ray Machines
Now defects are eliminated.

design have been made in the last ten years—all high voltage equipment is now immersed in oil in sealed containers, high voltage is carried to the tube in flexible, insulated cables, and operator protection is carried still further by providing lead-lined booths.

L. B. (G1) HYDRAULIC HACK SAW

A new hydraulic hacksaw which has, among other features, a saw frame that rises hydraulically to the highest point on completion of cut, has been recently developed by the L. B. Manufacturing Co., Los Angeles.

The saw also has infinite hydraulic feeds, self-compensating, flexible, con-



Hydraulic Hack Saws
The frame rises hydraulically.

stant pressure feed, integral three speed gear box, no clutch or countershaft and all working parts fully enclosed in oil.

The integral coolant pump is synchronized with the blade motion. There are no springs used to accomplish lift or feeds.

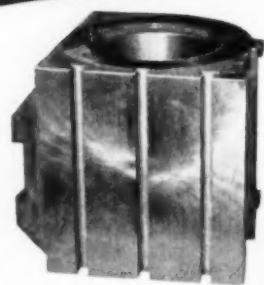
BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- ★ **Adaptability**
- ★ **Fixture Saving**
- ★ **Operation Saving**
- ★ **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

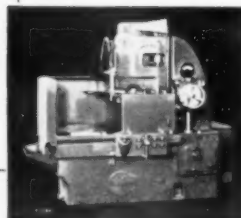
..... Especially
valuable on jobs like
the one illustrated.

PUT IT ON THE BLANCHARD



Semi-Steel
Stock per side 1/8
Limits ± .005
square .001
to .0015 in 16"

No. Sides 6
1 piece (6
surfaces)
1 hour and
35 min.



Grind LARGE WORK flat, square and parallel

THE SHAPER TABLE, 15 1/2" x 16" x 16", illustrated here, is an excellent example of large, heavy work which may be ground with ease on a Blanchard No. 18 Surface Grinder with 6-inch extended column. These tables come to the Blanchard as rough, semi-steel castings. Six sides are ground, 1/8" stock being taken off each side.

The BLANCHARD
MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



FOUND UNUSED WORKING HOURS

This is No. 1 of a Series on Engineered Machine Tool Rebuilding.

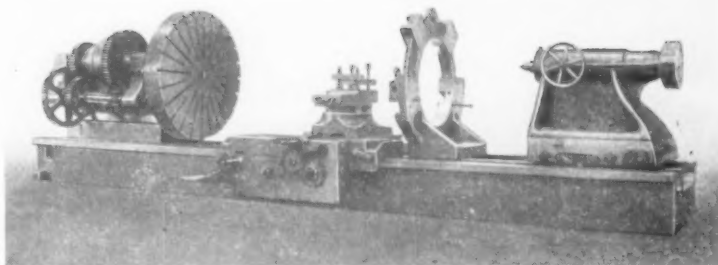
Never before in industrial history have the working hours of machine tools counted for so much. Merely to call a machine tool "old" or "used" is hardly a sufficient excuse today for exempting it from a vital role in the Defense Program.

It is important to remember that the span of life of a machine tool is measured in working hours. The series starting with this advertisement will reveal how, by Engineered Rebuilding, Simmons finds *unused* working hours in *used* machine tools.

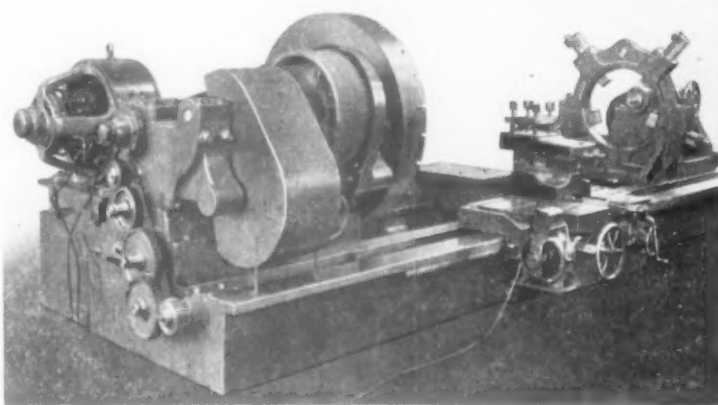
Send for this book to-day



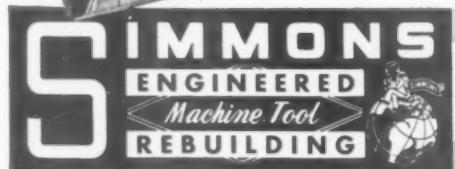
This 58-page book, "The Simmons Way of Engineered Machine Tool Rebuilding," will show you how to make the most of what you have.



BEFORE—An 84" heavy duty belt-driven lathe before it was rebuilt and modernized.



AFTER—The same lathe converted to a motor-driven machine. The drive is a 50 H.P., 300-1200 RPM motor. Power Rapid Traverse for the carriage has been applied and an extra length of bed added to extend the distance between centers.



SIMMONS MACHINE TOOL CORP.
1810 NORTH BROADWAY, ALBANY, N. Y.
NEW YORK OFFICE: 149 BROADWAY



Washing Machine Die Mold
The misspelled word is ready for reengraving.

HOBART WELDER (G2)

A 100 ampere electric driven arc welder manufactured by Hobart Brothers Co., Troy, Ohio, saved time and money in the correction of a misspelled word on a washing machine die mold.

To alter the misspelled word, that section of the die had to be built up without touching a raised bracket only 1/16 inch from each side of the word.

Preparations for the welding were simple. The mold was covered with asbestos with a hole cut in it just large

enough to permit welding on the problem area. The lettering was chiseled off very carefully and the entire mold heated to 350 degrees.

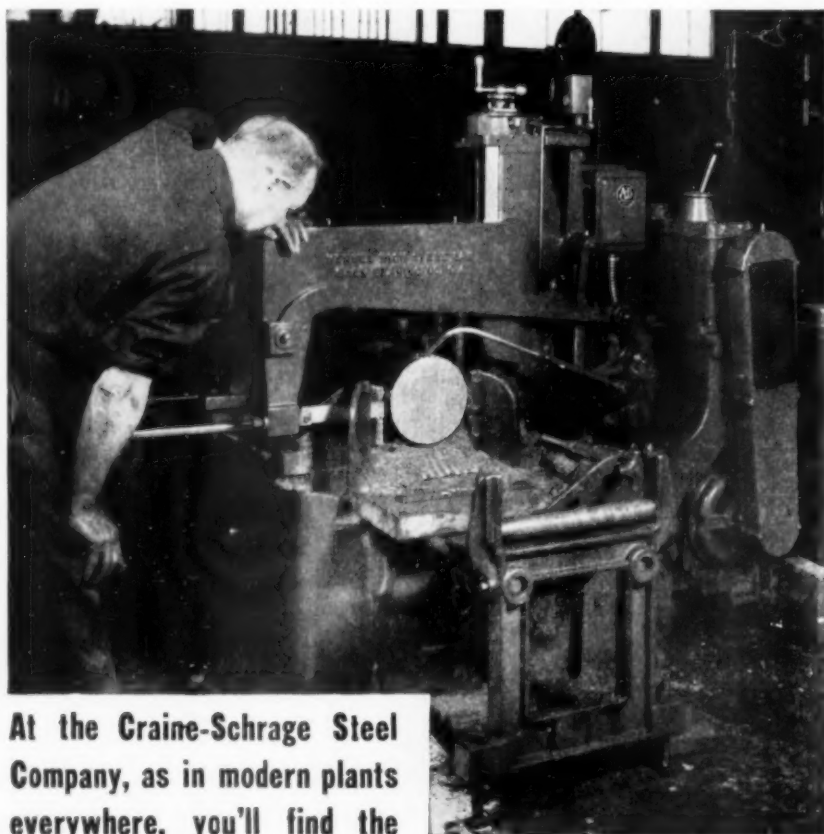
Then a single bead was welded over the lettering with an ordinary 3/32 inch mild steel straight polarity electrode at approximately 50 amperes. The entire welding operation took approximately 15 seconds after which the word was easily re-engraved.

PORTABLE WELDING GUN FOR ALUMINUM (G3)

A new, portable welding gun for aluminum, which is expected to find a wide field of application particularly in initial spot welding operations on aircraft assemblies requiring tacking of small parts, has been developed by the Progressive Welder Company, E. Outer Drive, Detroit, Michigan.

The gun is said to be especially useful where the work cannot be taken to stationary pedestal welders for it is supported on a universal type compensating hanger which permits the positioning of the gun at any angle desired.

The gun, with its transformer, is claimed can be used in combination with



At the Craine-Schrage Steel Company, as in modern plants everywhere, you'll find the

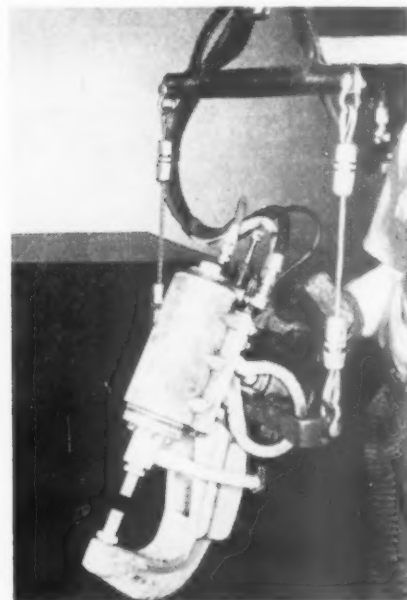
Hack Saws are MARVELS

Add this Detroit plant to the long list of leading steel companies, forge shops and industrial plants that have standardized on MARVEL Metal-sawing Equipment. In this plant you will find: a MARVEL No. 18 Saw, MARVEL No. 9A and No. 6A Heavy-duty High Speed Saws, and a MARVEL No. 8 Band Saw. So it is in modern plants in all parts of the country—MARVEL Sawing Machines predominate.

Whatever your metal sawing problem, whether cutting-off from bar stock or large billets, there are MARVEL Saws exactly suited to your needs. Your local MARVEL Sawing Engineer will gladly study your metal-cutting problems and recommend the most suitable methods and equipment to speed up your production.

ARMSTRONG-BLUM MFG. CO., "The Hack Saw People"
5700 Bloomingdale Ave., Chicago, U. S. A.
Buy from your local distributor.

Eastern Sales: 225 Lafayette St., N. Y.



Welding Gun for Aluminum
For initial spot welding.

virtually any control equipment used in the welding of aluminum. It is air-operated with two differential cylinders in tandem, designed to produce a maximum point pressure of 1200 lbs when using normal airline pressure.

All the operating mechanism is built into a gun "head", which may be supplied with yokes to fit individual needs. Also incorporated in the gun head is a manually controlled point retracting mechanism, which permits retraction of

WE'VE GROWN

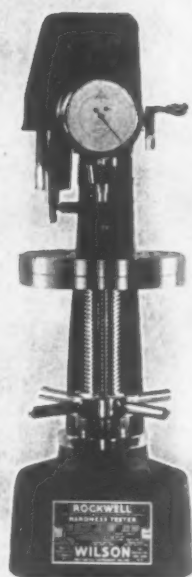
6½ TIMES
BIGGER
SINCE 1935!



There's basic business virtue in building a better product or we couldn't have increased our plant space 6½ times since 1935. Universal 'drill bushings have superfinished bore's straight and round within .0001 assuring accuracy and unexcelled wearing qualities. Black domes resist rust and improve appearance. All standard sizes available for speedy delivery. Write for facts.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN

"ROCKWELL" HARDNESS TESTER



Acknowledged Accuracy

WILSON

MECHANICAL INSTRUMENT CO., INC.
Concord Avenue, N. Y. City

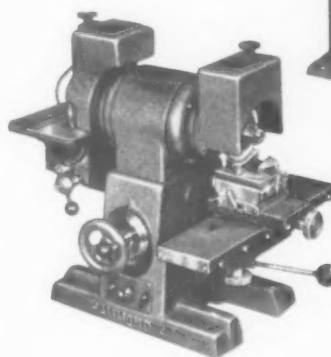
JANUARY, 1942

How HAMMOND GRINDERS PROVIDE COMPLETE CARBIDE TOOL MAINTENANCE



You, too, will get into something you're not "up to" if you try grinding vital Carbide Tools with an ordinary grinder. Let us tell you how simply HAMMOND CARBIDE GRINDERS (below) give you the hair-line accuracy so essential to keeping production tools sharp. The coupon below is for your convenience. Use it to get more information and prices TODAY!

First requirement of a Carbide Tool Grinder is accuracy. The HAMMOND "6" (right) gives it to you with adjustable work tables (removable by loosening one simple clamp) that can be accurately adjusted . . . point by point . . . from 0 to 20°. And the "6" motor . . . ½ HP . . . is plenty powerful for any load put on it's 6" wheel. Furnished with plain guards for dry grinding . . . integral guard and coolant tank for wet grinding with diamond wheel. Bench model or floor model (as shown). Get full details now!



Hammond "4" Chip Breaker Grinder

Get rid of that sharp, cluttering "hay" that spirals from cutting tools. Break it up with HAMMOND'S new CHIP BREAKER GRINDER that grooves Carbide Tools on any angle to hair-line precision. For information, just check the space below.

Hammond of Kalamazoo

HAMMOND MACHINERY BUILDERS, INC.
1636 DOUGLAS AVE. • KALAMAZOO, MICHIGAN
Eastern Branch - 71 West 23rd Street, New York City

Gentlemen:

Please send descriptive literature and prices on machines checked below:

☐ HAMMOND "6" CARBIDE GRINDER
☐ HAMMOND "4" CHIP BREAKER GRINDER

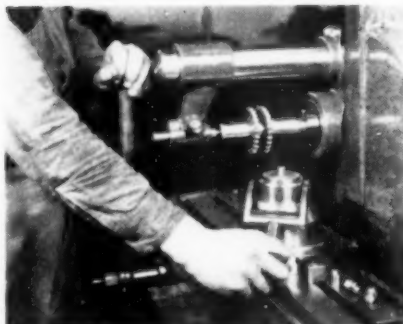
one electrode to permit cleaning of obstructions.

For structural spot welding of aluminum, it is claimed that the gun will handle up to two pieces of .040 inch thickness. It has a maximum stroke of 4 inches.

ZAGAR INDEX FIXTURE

(G4)

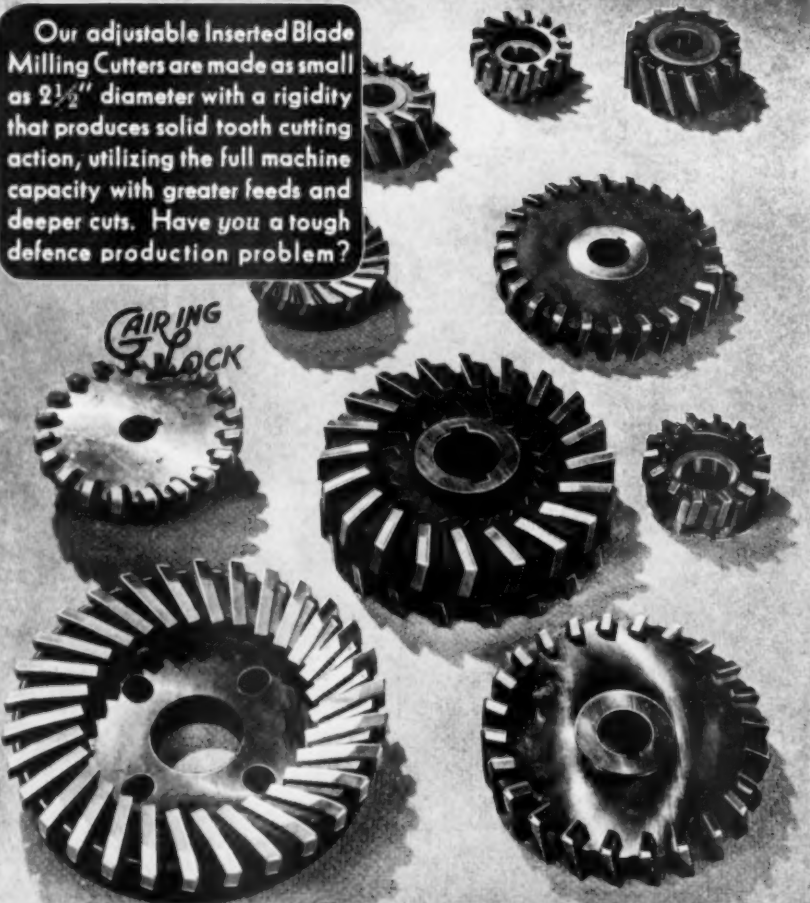
For rapid production work on millers, lathes, grinders and drill presses, Frank Zagar, Inc., 23880 Lakeland Blvd., Cleveland, has developed a new collet



Zagar Index Fixture
Takes all production abuse.

Gair-Locked Milling Cutters Solve Production Problems --- Conserve High Speed Tungsten Steel.

Our adjustable Inserted Blade Milling Cutters are made as small as 2 1/2" diameter with a rigidity that produces solid tooth cutting action, utilizing the full machine capacity with greater feeds and deeper cuts. Have you a tough defence production problem?



The GAIRING TOOL CO., Detroit, Michigan
In Canada: Hi-SpeedTools Ltd., Galt, Ont.



index fixture available in two sizes with 1 and 2 inch collets.

Whether used on any standard milling machine to mill slots, hexes, keyways, punches or taps, on lathes, internal or external grinders or on drill presses, this fixture is said to take all production abuse and is hardened and ground throughout.

Other features of the fixture include one handle for closing and indexing collet, collets and index plates are quickly interchangeable, positive stop-collet does not move, table keys and every part of steel hardened and ground.

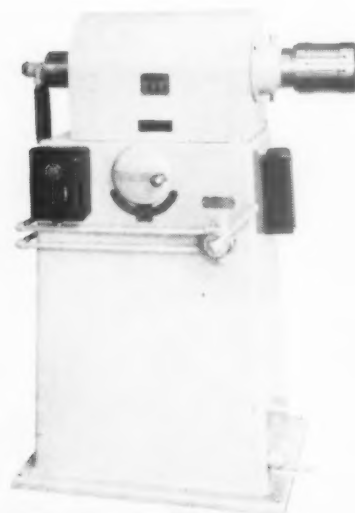
A pipe tap hole in lock screw is provided for pressure feed cutting oil. Oil will come up through collet to lubricate part and clean out chips.

SCHAUER SPEED LATHE

(G5)

Emphasizing speed in defense production, a new type variable speed lathe has been designed by the Schauer Machine Company, 2060 Reading Road, Cincinnati, for polishing and finishing engine barrels on aircraft engines.

Equipped with an air operated expanding mandrel, the machine has a



Schauer Speed Lathe
The mandrel is air operated.

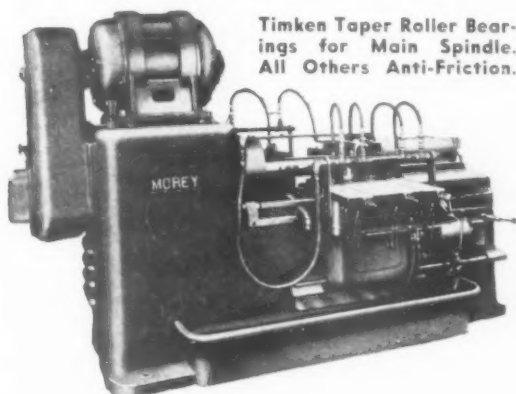
two-speed, 1/2 hp, 875 to 1750 rpm standard NEMA frame motor. Control is by means of a hand air valve, which, if desirable, can be replaced by a foot control.

The machine has any spindle speed desired from a low of 105 rpm to a high of 1155 rpm, while running. The assembly includes an exclusive, automatic brake that applies when the machine's foot treadle is depressed to open the motor circuit.

A single or two-speed motor can be supplied with this type lathe, allowing infinite selection of spindle speeds.

THE TOOL ENGINEER

MOREY "27" SEMI-AUTOMATIC HEAVY DUTY LATHE



Timken Taper Roller Bearings for Main Spindle.
All Others Anti-Friction.

Just the Machine for Shell Work!

Suitable for rough or finished turning shells at maximum feed.

Put your shell operations on this fast powerful lathe and turn out your work at top speed up to the limit of tool capacity.

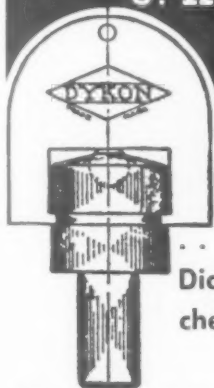
Multiple tool holders can be supplied at front and rear; a turret mounted on separate saddle can be used instead of tailstock.

Full use of carbide tools can be taken by this heavy duty lathe.

Ask for Circular No. 715

MOREY MACHINERY CO., INC.
410 Broome Street New York, N.Y.

Save Your Diamonds
WITH
J. K. SMIT & SONS, INC.



DYKON
GAUGE

... the device that protects your
Diamond Tools from abuse, that
checks loss... insures longer use.

Diamond at Safety Line.
Position of the DYKON
Gauge indicates that
Diamond has worn to
lowest safety level and
should be returned for
resetting.

Are You
USING
OR
ABUSING
and
LOSING?

J. K. SMIT & SONS, INC.
157 Chambers Street, New York, N. Y.
7 South Main St., Lowell and Finance Bldg.,
West Hartford, Conn. Pittsburgh, Pa.
— Detroit — Chicago — Seattle

ACCURACY..

with Ease



PLAN-O-MILL works to the
closest tolerances, and with **push-the-button ease**,—on
cylinder heads, spark plugs, breech blocks, propellor hubs
and blades, fuel injector parts, shells—all kinds of internal
and external threadings, chamfering, and concentric spot-
facing.



A typical Plan-O-Mill operation:
Thread-milling a 34 5/8 lbs.
part for anti-aircraft guns.

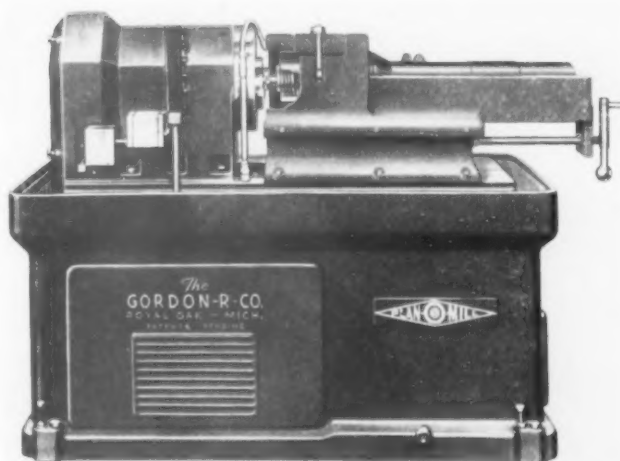
Thread size: 4.77" diameter,
6 pitch Acme.

Cutter size: 3 1/2 O.D.

Cycle time: 13 minutes.

Large, cumbersome parts are
held rigidly in Plan-O-Mill. All
motion is in the cutter head.

Let Plan-O-Mill's complete engineering service help put
you in the forefront of America's Victory Production Drive.
Particulars rushed. Write, wire, or phone today.



Plan-O-Mill with fixture for milling anti-aircraft gun parts. (See above)

The **GORDON-R-CO.**
627 Washington, Square Bldg.
Royal Oak Michigan

TAFT-PEIRCE BACK SPOT FACING MACHINE

Designed for counterboring or facing bosses through which a hole has been drilled, but which, because of an obstruction, it is impossible to counter-bore on a drill press, a new machine has been announced by the Taft-Peirce Manufacturing Company, Woonsocket, Rhode Island.

The part to be machined is mounted on a substantial cast-iron table near the front of which is a hole to allow the

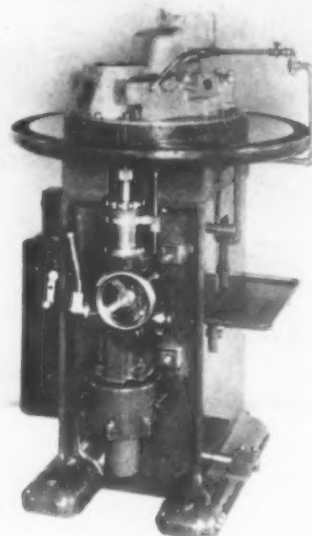
shank of the inverted counterbore to project through the table. The cutter is driven by a spindle just under the table.

Spindle and driving mechanism are of ball-bearing construction and driven through bevel gears by a one-half horsepower motor. By means of the change pulleys, speeds of 170 rpm for steel and 300 rpm for aluminum alloys are said to be obtained.

The spindle feed is by hand, either through a worm and worm-wheel, or direct by means of a rack and pinion. The power can be disengaged by clutch, so

as to rotate the spindle freely by hand if desired.

The machine is equipped with a coolant tank which is part of the table and



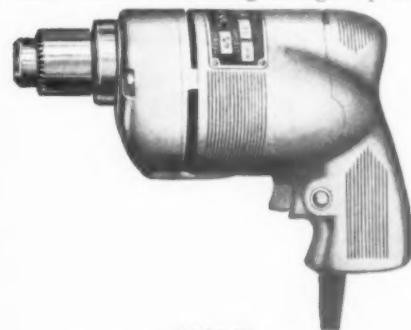
Back Spot Facing Machine
It gets by obstructions.

the coolant pump is mounted inside the base and driven from the cross shaft.

SKILSAW'S SKILDRILL

Because of its extreme compactness, light weight, perfect balance and ready power, the new Skildrill announced by Skilsaw, Inc., 5033-5043 Elston Avenue, Chicago, is claimed to be particularly suited for fast production drilling.

This $\frac{1}{4}$ inch drill weighs only $2\frac{3}{4}$ lbs, is only $6\frac{5}{8}$ inches long overall and only $2\frac{9}{16}$ inches wide. It is said to fit most comfortably in the palm of a man's hand for drilling in tight spots.



Skildrill
For fast production drilling.

Skildrill has a no-load speed of 1800 rpm and a full load speed of 1050 rpm. Drilling capacity in steel is $\frac{1}{4}$ inch and in hardwood $\frac{1}{2}$ inch. Other features include die-cast body, anti-friction ball and needle roller bearings, helical-cut gearing, two-pole momentary contact switch with lock for continuous operation and a universal motor.

Eliminate hazardous and expensive to operate line shafting.

LIMA GEAR SHIFT DRIVES

will provide greater flexibility of machine operation, as well as increase the safety factor in your plant. These units are adaptable to any type of machine requiring selective speeds. Lima Gear Shift Drives are available in all sizes up to 25 H. P. Step up your DEFENSE production—write today for data covering your requirements—no cost or obligation on your part.

THE LIMA ELECTRIC MOTOR CO.
Builders of Industrial Motors
LIMA, OHIO U. S. A.

Tough to Beat!



SEND
FOR
OUR
CATALOG

this JEFFERSON
"BULL DOG"
MODEL
MOTOR DRIVEN
PRECISION
MILLING MACHINE

- Floor or Bench type.
- Power feed, quick acting hand feed.
- Table working surface 14" x 4 3/4".
- Constructed to handle a variety of attachments.
- Equipped with three T slots for tight clamping of work or fixtures.
- Proved performance in die sinking, contour profiling, routing of ferrous and non-ferrous metals, and other essential operations in the tool room.

DELIVERY 90 DAYS

• Write for a folder describing this new machine. Also request descriptive circulars of our Tail-Stock Turret, Tool Post Turret, End-less Belt Sander, Swing Frame Grinder and Foundry Riddle.

JEFFERSON MACHINE TOOL CO.
SWEENEY, CUTTER and FOURTH STS. CINCINNATI, OHIO

Columbia TOOL STEEL

TO DETROIT USERS—

In the Detroit district S. E. Sjogren, District Sales Manager, and staff offer users a wide operating and field experience.

Office and warehouse, 1718 Howard Street; phone Randolph 2584.

*It pays to use
Good Tool Steel.*

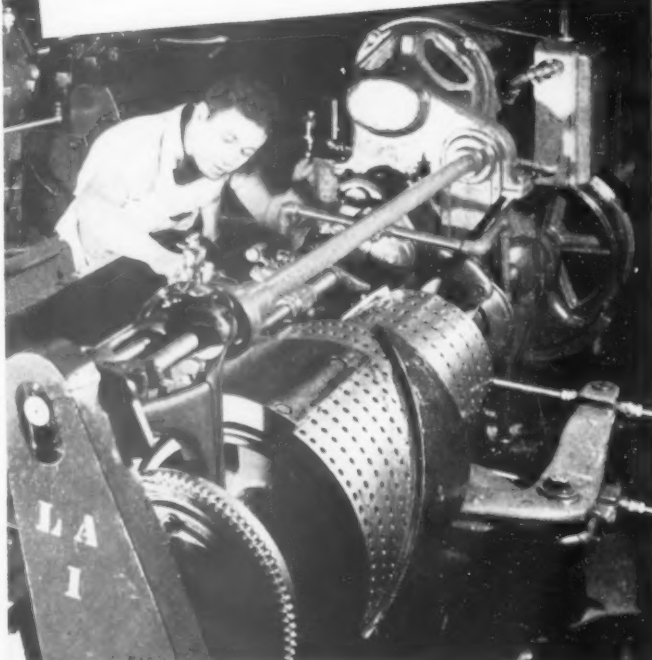
COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT

GENERAL OFFICE AND WORKS

500 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

WINCHESTER REPEATING
ARMS USES MODEL 'B'
IN THEIR TOOL ROOM!



• Cartridge case draw punches are consumed at a rapid rate by Winchester Repeating Arms Co., Division of Western Cartridge Company at their New Haven, Connecticut plant. Because of this fact, Winchester uses Model B Cleveland Automatics in their tool room, manufacturing these draw punches in lots of 2000 pieces at a run for production. Made in long and short lengths to accommodate work up to 18-inch stock feed, Model B can be equipped with rotary tilting or hopper magazine attachments for secondary operations. Model B Cleveland Automatics are built in a range of sizes from 1 1/16-inch to 2 1/2-inch capacities. Ask for descriptive literature and specifications if you have tap blanks, shafts with multiple diameters, nipples, various types of studs and similar parts to produce in quantity.

THE CLEVELAND AUTOMATIC MACHINE COMPANY
2260 ASHLAND ROAD, CLEVELAND, OHIO

Sales Offices at:

Newark, 15 Washington Street • Detroit, 2842 W. Grand Boulevard
Chicago, 565 W. Washington St. • Cincinnati, 507 American Bldg.

CLEVELAND
Single Spindle
AUTOMATICS

CHALLENGE BENCH PLATES

Now available from the Challenge Machinery Company, Grand Haven, Michigan, are small precision ground, semi-steel bench plates that are so necessary for many types of assembly, layout and inspection operations.

These plates, which provide an accurate plane surface, are particularly required for the inspection and assembly of small parts in aviation and automotive plants.

Challenge Bench Plates are made of



Challenge Bench Plates
Required for inspection and assembly of many small parts.

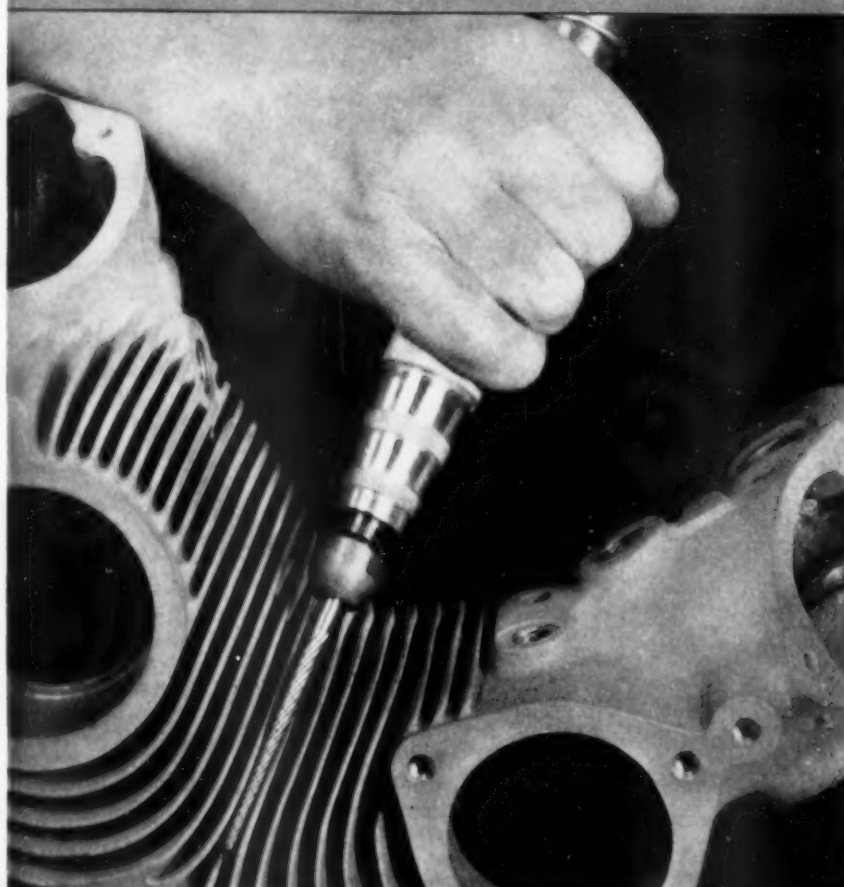
iron and steel with all sides machined at right angles to the top surface. It is

said that they provide rigidity and strength and assure a smooth, solid working surface.

Nine standard sizes are available, two, four or six inches thick. Special sizes can be made to order.

JARVIS

for Cleaning and Finishing your Difficult Aluminum Castings . . .



C. L. JARVIS CO.
MIDDLETOWN  CONN., U.S.A.

PECO RIVET SETS

A new type of rivet sets have been announced by Products Engineering Company of Los Angeles which are said to be 100 per cent forged for precision and strength, and designed particularly for aircraft riveting.

Claimed to be almost foolproof even when used by amateurs, the sets are available in two types: for flush rivet-



Peco Rivet Sets
Designed for aircraft riveting.

ing or for standard brazier and round head riveting.

According to the manufacturer, Peco Flush Rivet Sets have a face design that eliminates dishing and marring of skins and surfaces while the standard rivet sets are designed to avoid ringing and marking when tipped to angles up to 7 degrees.

FOR YOUR CONVENIENCE
Use the Business Reply Cards
in this issue
See Page 101

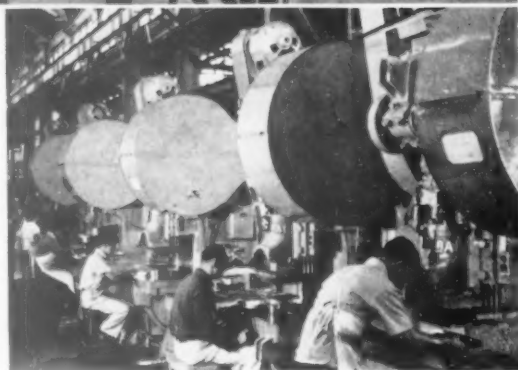


INCREASED PRODUCTION with **NIAGARA** PRESSES & SHEARS

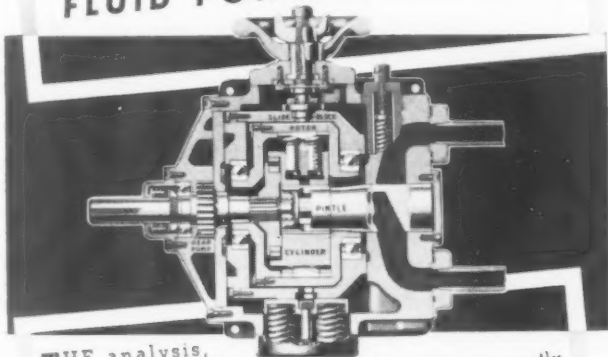
ABOVE: Part of a battery of 18 new Niagara Shears stepping up production in huge new airplane plant.

RIGHT: View of part of the press room in one of America's defense plants where Niagara Presses are working 24 hours a day and seven days a week.

NIAGARA MACHINE & TOOL WORKS, BUFFALO, N. Y.



Simplify Your Linear or Rotary Drives With **OILGEAR** FLUID POWER Equipment



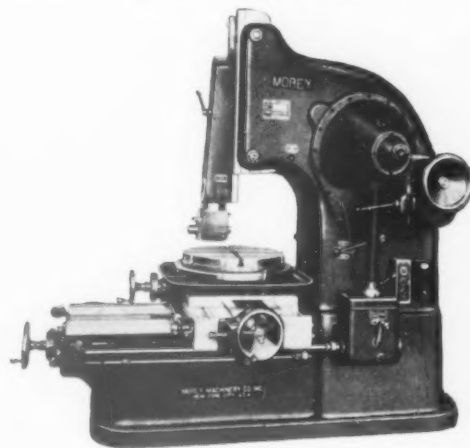
THE analysis, design and installation of your machine and process drives are greatly simplified when you use Oilgear Pumps, Motors and Transmissions. They pack more power into less space, provide maximum efficiency, dependability and long life. Oilgear construction permits fast, easy, compact set-up with little piping. Smooth, cushioned reversal of power; steplessly variable speeds and pressures. A wide range of electrical, hydraulic, mechanical, automatic or manual control meets every need. For a simpler answer to your linear and rotary drive problems, write today for Bulletins 44100, 47000 and 60000 THE OILGEAR COMPANY, 1312 W. Bruce St., Milwaukee, Wis.

Trademark
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MOREY VERTICAL SHAPERS

Timken Taper Roller Bearings for Main Spindle
All Others Anti-Friction



Built in two sizes
8" stroke
12" stroke

Accurate — simple for toolroom manufacturing. Self-contained motor drive.

Ask for Circular No. 726

MOREY MACHINERY CO., INC.
410 Broome Street New York, N.Y.

Handy Andy Says—



ORDINARILY, I like to write of the things that give pleasure and evoke smiles and the badinage privileged to friends, with, perhaps, a thought or two on the serious side. But

right now, smiles are apt to be straight lipped and grim with a deadly purpose as the nation coheres for the job ahead. For if the Japs got in the first lick, aping another totalitarian power that, assassin like, also stabbed a friend in the back, they did for us what gales of patriotic oratory had failed to accomplish; they fused America into one solid, single purposed unit. Oh yes, the little brown men started something, but that's only the beginning; once we really start rolling 'em off the line the banzai of the Japanese gamecock is going to sound like a dying squawk compared to the clarion Victory scream of the American

eagle. Which brings to mind a story I read a while back.



A number of gobs, on shore leave on the Islands, attended a cockfight one evening, and in the course of the feathered tournament just about lost their collective shirt. However, they got in a huddle and made the brown boys a proposition; they'd be back the next night with an American bird and sackfuls of coin, winner take all. Okey dokey! Sure enough, they showed up the next night with bulging pockets and a big, bedraggled looking cock that regarded the first of his strutting opponents with listless detachment. Then, stung to action by his adversary's opening slash, he reached out a lazy claw, grabbed him around the neck, and wham! One down, then two, three, four and so on until the local flock had but one end—the stew-pot. The gobs collected their winnings and their champion and went away contented. The only repercussion was that the Old Man who was foreman of the Battlewagon stormed and swore for weeks thereafter, threatening court martial for the blankety blank galley swab who's gone and plucked the feathers off the ship's mascot—a bald headed eagle—and made him look like a dodgasted eunuch instead of lord of the barnyard harem.



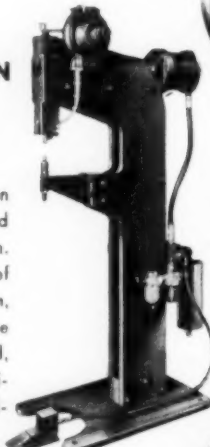
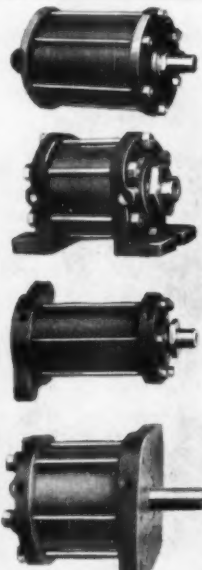
Yes, we're going to win, even if our tail feathers did get rumbled a bit at the start. For it's not the ultimate result that worries me so much as our tendency, as a people, to underrate the peoples of other lands. And certainly it is sheer folly to underrate an enemy to whom death is but a short cut to his pagan heaven and who, because of that fanaticism, eagerly approaches the final adventure. Nor may we place undue hope in Japan's comparatively limited resources, for we are reminded that Germany was considered practically bankrupt at the outset of the war, yet built and has maintained a colossal war machine only latterly arrested by the combined forces of Boreas and the Reds. The democracies just underrated Hitler, even as the world under-estimated a previous "little corporal" who upset the established order of things a century or so ago. (But look where he landed!) We'll just have to learn to take things at their face value, and personally, I think we're in for a long war. And when we have won that—as we shall!—there may be a long, long trail back to the prosperity that we've known—that is, unless something is done about it. Something will have to be done, and something on that order will be outlined


New

TOMKINS - JOHNSON

Air Powered RIVITOR

Furnishes "air squeeze" action combined with automatic feed riveting for aircraft production. By using a different type of rivet set and jaw construction, Counter Sunk Head Rivets are handled as well as Flat Head, Round Head, Full and Semi-Brazier Head Rivets. For specifications, etc., write Dept. T.



Air Cylinders



Hydraulic Cylinders

EQUIPMENT HELPS ATTAIN MAXIMUM SPEED IN PRODUCTION

T-J AIR CYLINDERS

These units exert power movement from 100 lbs. to 12,000 lbs. (direct). Made in styles, sizes and strokes to meet your requirements.

T-J HYDRAULIC CYLINDERS

Designed and furnished in types and sizes to exert power movement from 1,000 lbs. to 50,000 lbs. (direct).

For Catalogs on these cylinders
write Dept. T.

THE TOMKINS-JOHNSON CO.

Jackson • • • Michigan

You Should Know About These High Production Detroit Power Screwdrivers

DRIVE SCREWS FASTER
THAN EVER BEFORE

NO MARRING OF HEADS
UNIFORM TENSION
NO STRIPPING OF THREADS

MACHINE SCREWS
WOOD SCREWS
SELF-TAPPING SCREWS
DRIVE SCREWS
SPECIAL SCREWS

STANDARD OR SPECIAL HEADS

SEND SAMPLES FOR
PRODUCTION ESTIMATES

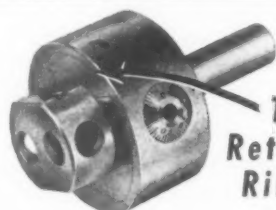


Magazine Feed
Power Screwdrivers

DETROIT POWER SCREWDRIVER CO.

2805 W. Fort St.

Detroit, Mich.



This
Retaining
Ring on

★ ★ ★ FRAY MICROMETER - OFFSET Boring Heads

... helps carry the load thrown on the tool carrying block—keeps chips from micrometer mechanism—eliminates sharp corners that might catch on operator—maintains full strength with all the advantages of round construction. An exclusive feature.

FRAY MACHINE TOOL CO.

505 W. WINDSOR

• GLENDALE, CALIF.

Makers of "ALL ANGLE" Milling
Machines and Milling Attachments

UNIVERSAL

CENTERING CHUCKS AND FLOATING
CHUCKS FOR SPEED AND ACCURACY



Universal centering chucks (left) make a centering machine out of a drill press. Accurate and sturdy. Depth adjustment for centers.

Both centering and floating chucks available for speedy delivery. Write for catalog.



Universal floating chucks (right) are designed to operate horizontally in automatic screw machines and turret lathes. Adjustable spring pressure in 4 directions prevents dogtail motion and marred holes.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

in the February issue of THE TOOL ENGINEER. Watch for it.

Had the pleasure of attending Detroit's December meeting, the occasion being Presidents' Night at No. 1. The entire Exec. Committee was there along with several ex-brass hats at the speakers' table as well as various big shots (only we're not that way in the A.S.T.E.) scattered here and there below the salt. Lee Diamond, likeable but modest Ch'man of Detroit Chapter, extended greetings and exhorted No. 1 to

"hold that cup", then turned the meeting over to Joe Siegel, dean of the presidential college. Joe extolled the virtues of his successors, among whom present were Bill Smila, Bert Carpenter and Walter Wagner. He also presented the incumbent Board, among which 1st. V. P. Otto Winter and 2nd. V. P. Ray Morris responded with short speeches, the former in connection with the A.S.T.E. Defense Training Program. Treas. Frank Crone and Nat'l. Secy. Clyde Hause took bows; being local boys, like some of the ex-presidents, they weren't regarded as "company".

Also among those present but not mentioned (an omission I'm taking the liberty to correct here) were past National Secretaries Al Sargent, Charley Staples and Floyd Eaton. Noticed various other luminaires in the industrial and educational fields in the audience, among them Cornelius Lowell of Wilbur Wright Trade School, said institution doing a swell job right now in Defense Training. A number of Detroit Student Chapter boys were there, too, to be commended for—well, we'll censor that. Say for crashing in where their Seniors would like to look. Oh, it was a big evening, reminiscent of a National Convention on a not so small scale.

The preliminaries disposed of, Joe Siegel introduced Frank Curtis, A.S.T.E. President who, if energy and constructive endeavor count, must be a whale of a Ch. Eng'r. for Van Norman Machine Tool. Before swinging into the subject of his talk—Tool Engineering—Frank commented on the late Ford Lamb's fine work as Executive Secretary and the problem confronting the Board in the selection of a successor. Well, that will take fine discrimination, for though many may feel called but one can be chosen. As I see it, the appointee must be a man with unusual qualities and endowed with a broad vision that transcends narrow provincialism, for, at the rate the Society is growing, there must inevitably come the time when we shall have to call ourselves the International Society of Tool Engineers. And you know, we may have to do as the Swedes did back at the turn of the 19th century. When the last of a line of kings passed away, and choice of a successor portended jealousies and factional differences, they wisely went abroad for their man. And cold history records that the Bernadotte dynasty has been a force for construction, not only in the land of adoption, but in the world's work as well. The point I am bringing out is that we must first and foremost consider the future of the Society, and to that end the individuals must subordinate their own aspirations to the good of the order.

Since Mr. Curtis' speech has been largely covered in THE TOOL ENGINEER I'll not go into detail. But what I liked, personally, and what appealed to the audience as a whole, was the clearness of the line drawings used to illustrate his remarks. While the speaker stressed initiative in design and reception to new ideas, the slides nevertheless included many of the simple but positive, old reliable devices that are still conducive to

(Continued on page 147)

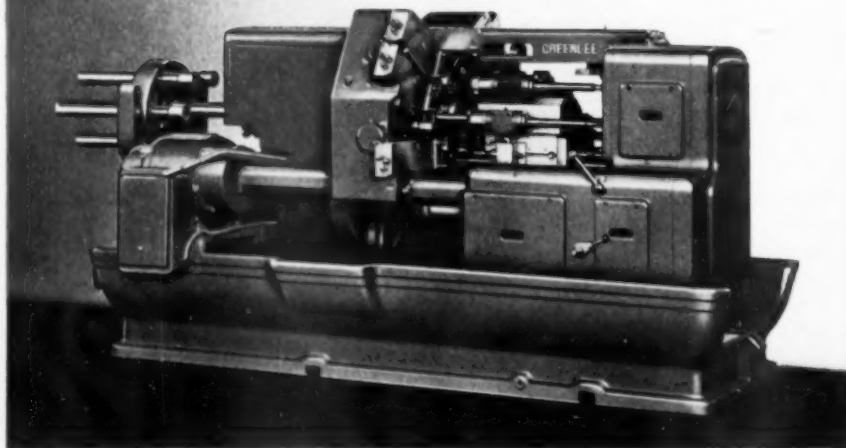
THE TOOL ENGINEER

5 KINDS OF SPEED IN GREENLEE AUTOMATICS

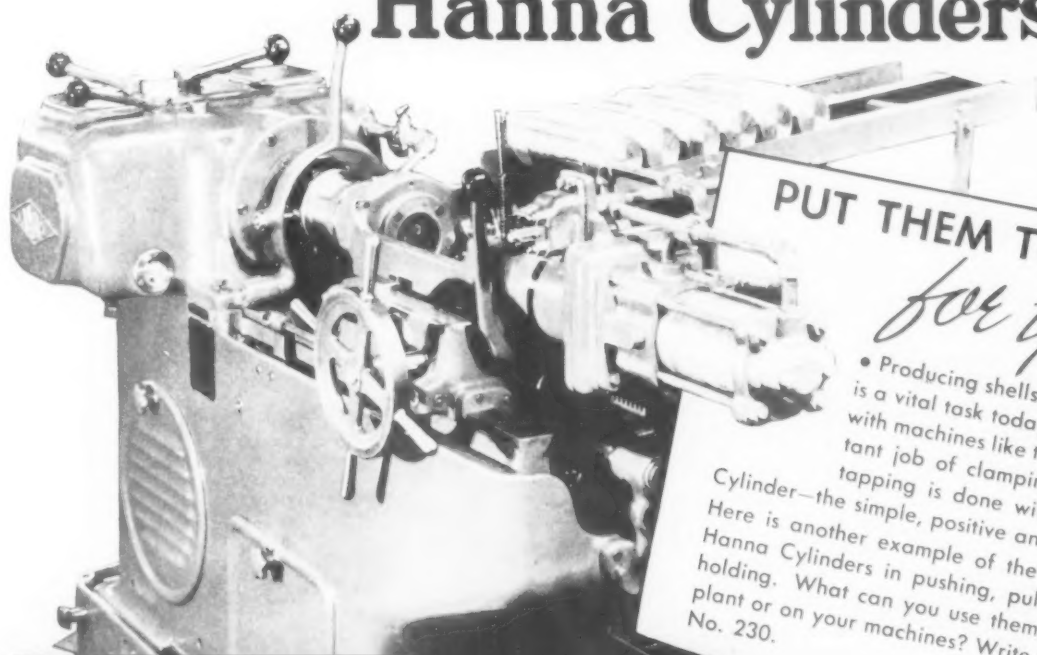
Here's speed designed and built right into the machine . . . five kinds of speed in every Greenlee Automatic Screw Machine turned off the assembly floor. Speed in a machine today, involves more than actual running time, it's a combination of various factors which help to lower the total production time required for a job. Here are five reasons why Greenlee Automatics can save you time, and increase production on every job . . . long or short runs.

- 1 The wide range of tool slide feeds and spindle speeds permits maximum operating speed.
- 2 Set-up time is cut to a minimum because of convenient collet arrangement . . . separate, interchangeable cross-slide cams . . . and the end working slide which is controlled by easily adjusted dogs on face of the worm wheel.
- 3 The tool slide arrangement makes possible the splitting up of long operations and the grouping of successive operations at one position to insure the fastest possible production time.
- 4 Sturdy, rigid construction in the frame and operating parts eliminates costly down time due to breakage and wear.
- 5 The wide open accessibility to all tools and spindles and the handy arrangement of all controls and adjustments make the Greenlee faster to operate.

GREENLEE BROS. & CO. • ROCKFORD, ILL.



Another Problem Solved with Hanna Cylinders



PUT THEM TO WORK
for you!

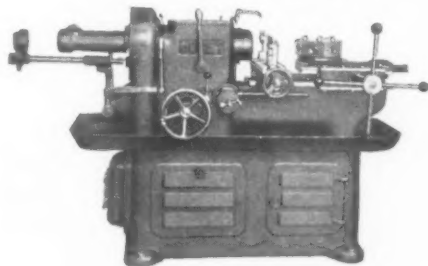
• Producing shells—fast and many—is a vital task today. We're doing it with machines like these. The important job of clamping the shells for tapping is done with a Hanna Air Cylinder—the simple, positive and efficient way. Here is another example of the 1001 uses for Hanna Cylinders in pushing, pulling, lifting or holding. What can you use them for?—In your plant or on your machines? Write for catalogue No. 230.

HANNA ENGINEERING WORKS

1765 ELSTON AVENUE • CHICAGO, ILLINOIS
RIVETERS • CYLINDERS • AIR HOISTS

MOREY No. 2G & No. 3 Turret Lathes Motor Drive INFINITE SPINDLE SPEEDS

Timken Taper Roller Bearings for Main Spindle
All Others Anti-Friction



	No. 2G	No. 3
SPEEDS from	90 to 1800 R.P.M. or 180 to 3600 R.P.M.	60 to 2100 R.P.M. or 100 to 3600 R.P.M.
CAPACITY	1"x6 1/2" turning length	1 1/2"x9" turning length Made in Plain and Universal Types

Ask for Bulletin No. 629 Ask for Bulletin No. 727

Any spindle speed you want—a direct reading dial shows when you've got it.
Permits the use of carbide tools for fast cutting.
Turret clamps and unclamps automatically.
Equally effective on second operation and chucking work.

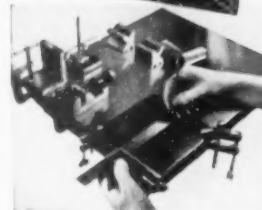
MOREY MACHINERY CO., INC.
410 Broome Street New York, N.Y.

New Improved Surface Plates



**at unusually
Low Prices!**

At remarkably low prices you can now get these new Delta Surface Plates offering features never before available in plates of this type. They are precision ground to close limits . . . all edges are machined square with each other and with the face . . . they have wide ledges all around for clamping work, angle plates, vises, etc. . . and are of massive construction with heavy ribbing to prevent warping. Ideal for layout work . . . simple to convert into precision plates, if desired, by handscraping to each other or master plates. Far superior to makeshift plates.



TWO SIZES:

No. 640—15"x18" at \$16.00;
No. 641—16"x22" at \$23.50.
Immediate delivery. Order from

THE DELTA MANUFACTURING CO.
609A E. VIENNA AVE. MILWAUKEE, WIS.

THE PASSING PARADE

Promotions . . . Personals . . . Deaths . . .



Arthur A. Schwartz, chief research engineer of the Bell Aircraft tool department, was honored for outstanding contributions to national defense by the National Association of Manufacturers at New York on December 5.

As a guest of a NBC program which cited him as the N.A.M. winner for "contributing most to production meth-

ods in the last year", Mr. Schwartz thought he had been summoned to New York just to represent his company at the meeting, thus his designation to receive one of the annual prizes was a complete surprise to him.

During a lifetime of varied business interests, he has designed and built a number of machines and equipment,

superintended a construction company and carried on a retail radio business before coming to Bell Aircraft. He is a member of the Buffalo, Niagara Frontier Chapter of the A.S.T.E.

T. I. Phillips, who, as a tool maker, started to work for Westinghouse in 1915, has just been elected a vice president of that company. Steady advancement followed success and in 1933 he became works manager for the company

THESE 2 SIZES OF SKILDRILL ARE A "MUST" IN EVERY DEFENSE PLANT!

NOW, more than ever before, you need these two modern SKILDRILLS to punch holes in every bottleneck . . . to speed your entire production flow! There's extra power, extra speed, extra ease of handling built into these two compact SKILDRILLS . . . for precision production drilling in plants building aircraft, tanks and all other defense or assembly work.

Ask your distributor to demonstrate these SKILDRILLS on your own work. Once you see how they perform, you won't be without them!

SKILSAW, INC., 5051 Elston Ave., Chicago
 New York, Boston, Buffalo, Philadelphia, Cleveland,
 Detroit, Kansas City, Atlanta, New Orleans, Los Angeles,
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SKILDRILL Model 80
 Capacity 1/2 in. in steel,
 1 1/4 in. in wood. Only
 11 1/2 in. long, 3 1/2 in.
 wide, weighs only 3
 lbs. Gets into tightest
 places.

SKILDRILL Model 45
 Capacity 1/8 in. in
 steel, 1/2 in. in wood.
 Only 6 3/4 in. long,
 weighs only 2 3/4 lbs.
 Fits the palm of
 your hand.

SKILSAW PORTABLE ELECTRIC TOOLS
 ★ FOR THE DEFENSE OF AMERICA ★



Westinghouse's Phillips
His advancement continued.

and then assistant to the president since February of this year.

James W. Parker, vice president of engineering for the Detroit Edison Company, was elected as the new vice president of the American Society of Mechanical Engineers. Mr. Parker has been with Detroit Edison since 1910.

The Heppenstall Company's Pittsburgh plant received the Navy "E" and Ordnance Flag for excellence in fulfilling vital Navy contracts.

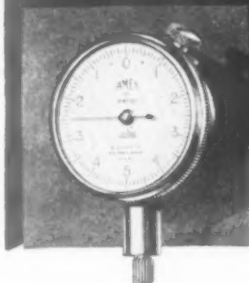
John H. Ashbaugh has been appointed as manager of manufacturing and engineering of the Westinghouse merchandising division. Starting with the company in 1918, Mr. Ashbaugh now directs these activities of the two merchandising division plants which are now at work on defense orders.

A. H. Godfrey, formerly Cleveland district manager for the Carboly Company, Inc., has been appointed Factory Manager of the Detroit plant.

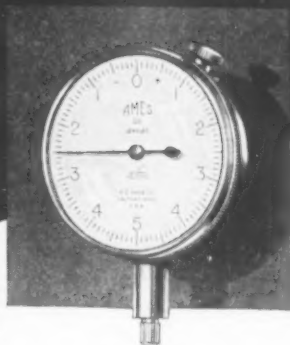
O. V. Green, assistant metallurgist of the Carpenter Steel Company and associated with the company since 1928, has been made Manager of Tool Steel Sales.

B. M. Brownell has been appointed as

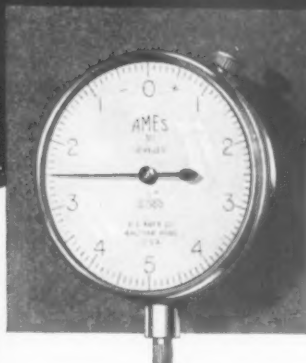
AMES *Hundred Series* DIAL INDICATORS



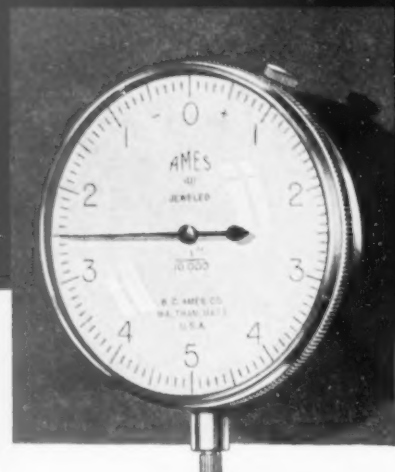
100 Series
1-11/16" diam.



200 Series
2 1/4" diam.



300 Series
2 3/4" diam.



400 Series
3 3/4" diam.

Entirely New . . . Alike Except in Size

A complete line of modern indicators of the latest design and with exclusive features, developed from experience gained during a half century of manufacturing only the finest instruments of their kind. Superior to all others in quality, accuracy and durability, yet they cost no more. Investigate and compare them.

Catalog No. 52 on request.

B. C. AMES CO., WALTHAM, MASS., U. S. A.

ARMSTRONG LATHE AND MILLING MACHINE DOGS



Because they are correctly designed and balanced and are drop forged from tough open hearth steel, heat treated to extreme stiffness . . . because they have alloy steel screws that are hardened at the point to prevent up-setting, and have

oversize hub that permit retapping . . . ARMSTRONG Drop Forged Lathe and Milling Machine Dogs **have double life** . . . are universally recognized as the finest obtainable. 11 types, all sizes. Write for Catalog.



ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

360 No. Francisco Ave., Chicago, U. S. A.

Eastern Sales: 199 Lafayette St., New York



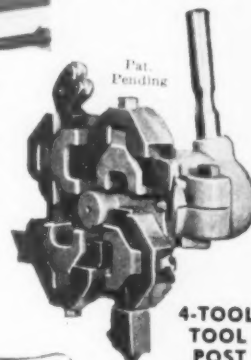
JANUARY, 1942

SPEED-UP PRODUCTION— LOWER COSTS

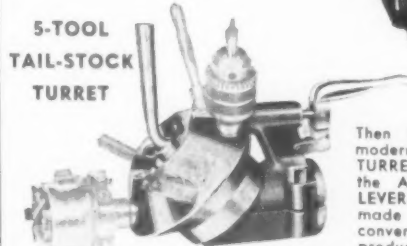


Convert Your
ENGINE LATHE
into a
TURRET LATHE
in
15 Seconds

This new modern TOOL-POST TURRET, made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard made tool holders which can be easily inserted and rigidly held.



4-TOOL
TOOL
POST
TURRET



5-TOOL
TAIL-STOCK
TURRET

Then there's the completely modernized 5 Tool TAIL-STOCK TURRET, made in 4 sizes. Also the ADJUSTABLE PULL-FEED LEVER. All tools are precision made attachments which will convert any engine lathe into a production turret lathe.

Write for bulletin of these and other JEFFERSON TOOLS.

JEFFERSON MACHINE TOOL CO.
669-679 W. 4th ST.
CINCINNATI, OHIO

exclusive representative in the Missouri territory for the Despatch Oven Company.

K. R. Beardslee, Sales Manager for the Carboloy Company, Detroit, will have charge of the centralization of the company's sales engineering department.

R. V. Mann, who has been assistant to the President of the Carpenter Steel Company in which capacity he supervised the sales of stainless steel, has been promoted to General Sales Manager of the company.

E. R. Goss has been promoted to branch manager of the El Paso office of the Chicago Pneumatic Tool Co. Mr. Goss has been with the company as a salesman since 1929.

A number of changes in the Norton sales organization are announced by W. R. Moore, general sales manager.

J. E. Strachan, Jr. of the Cincinnati territory has been assigned to the Pacific Northwest which includes the states of Washington, Oregon, Idaho, Montana and Wyoming where he replaces A. M. Pitts who resigned on October 1.

S. F. Prescott of the Worcester sales engineering department becomes salesman for the Cincinnati territory.

J. P. Enright, formerly a member of the Chicago office staff, becomes field engineer for the Chicago district.

Wendell C. Forsman (son of Dave Forsman of Michigan Tool) has been appointed field engineer for Norton, for Detroit and vicinity. He has been in the sales engineering department at Worcester.

The appointment of Mr. E. C. Bolton as manager of the Cincinnati District Sales Office is announced by Cutler-Hammer, Inc., pioneer electrical manufacturers.

Died

Clifford S. Stilwell, executive vice president of the Warner & Swasey Com-



Warner & Swasey's Stilwell
The industry knew him well.

pany, Cleveland, died of a heart attack in St. Luke's Hospital.

Born in Freehold, New Jersey, in 1890, Mr. Stilwell came to Cleveland with his family in 1903. After graduating from Denison University in 1912, he entered the Warner & Swasey Company as a special apprentice. He became manager of the company's Detroit office in 1914, general sales manager in 1930, and vice president in 1935.

Well known throughout the machine tool industry, Mr. Stilwell had just been elected president of the National Machine Tool Builders' Association.

J. S. Marlowe, district representative for the Jessop Steel Company at Indianapolis died from a cerebral hemorrhage. He was 60 years old at the time of his death.

Representing the Jessop Steel Company for the past twenty years in the Indianapolis district, Mr. Marlowe was a member of the American Society for Metals and a veteran of the Spanish-American War.

FOUR-IN-ONE! The conserving of material—the shortening of time—the lessening of labor—and the saving of money. Each one is an accomplishment. The 'four-in-one' is an achievement.

"Four-in-one" as just stated is the very definite contribution that the Severance Tool Company has made to Fitting and Finishing throughout the Metal, Wood, and Plastic Industries.

In 1930, Mr. R. M. Severance gave his attention to Hand Cut Rotary Files, and especially to the waste in the fact that "hand cut files must be scrapped" without virtue of being resharpened.

This thought and subsequent efforts led to the birth of MIDGET MILLING CUTTERS. "Ground from the Solid after Hardening" makes "Regrinding" possible; and, also, the "four-in-one saving" . . . ONE, in conserving High Speed Steel—TWO, in faster performance—THREE, in longer operational life—and FOUR, in money saved through "Regrinding", which reclaims most of the Severance Midget Cutters even scores of times.



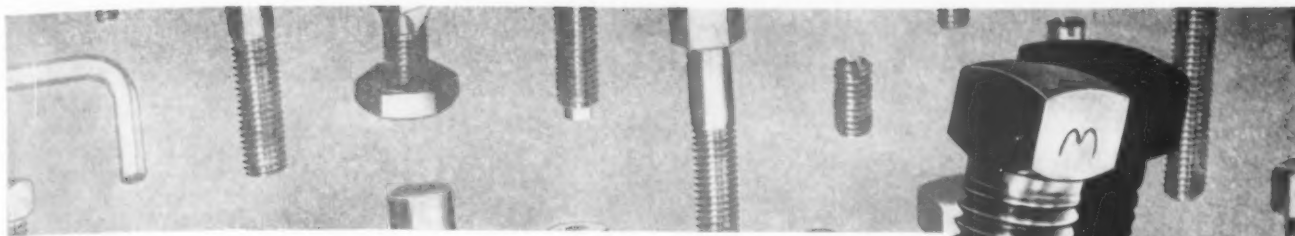
MANUFACTURERS OF
Midget Milling Cutters—
"Chatterless" Countersinks—
Tube Deburring Cutters—
and Special Tools.

Although delayed deliveries are still in evidence, Severance continues to think in terms of Engineering Service, and in greater Production and Regrinding facilities, including their completely equipped Western Service Branch located at 3844 S. Santa Fe Avenue, Los Angeles, California.

SEVERANCE TOOL COMPANY

1522 East Genesee Avenue
SAGINAW, MICHIGAN

"REGRINDING SAVES STEEL, TIME, LABOR, AND MONEY"



NEED THE STRONGEST?

Then Try Mac-it Square Head Alloy Steel Set Screws!

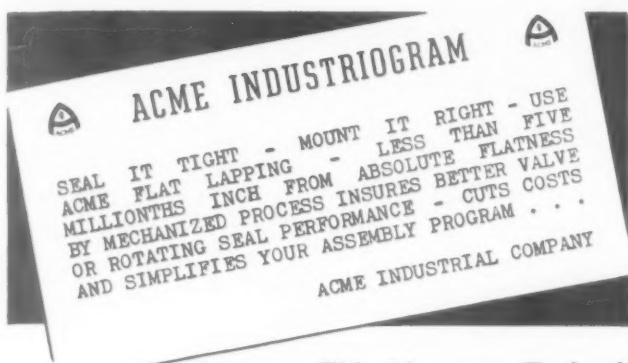
You'll find the "pioneer" of the Mac-it line offers amazing resistance to mushrooming of the point and breakage under the head. Mac-it square heads are used on the toughest **holding-down** jobs—such as bearings of forming machines, giant axle housings, road machinery, textile machines, locomotives, and coal cutting machines.

Mac-its are milled from the bar, and heat-treated for maximum strength. Specify Mac-it alloy steel set screws when you need the strongest.

For information on the only complete line of alloy steel screws, write for Catalog 40.



THE STRONG, CARLISLE & HAMMOND COMPANY
1392 West Third St., Cleveland · Ohio



Answer This Message Today!

★ Find a better solution to **your** sealing problem. Send blueprint or sketch of your seals, or details of your sealing requirements where fluids must be retained around rotating shafts, or by disc type valves.

Acme flat lapping provides a perfect seal because the mating surfaces can be finished to within .000005 inch from absolute flatness. This, together with correct mounting, insures a seal which is initially tight and will remain so indefinitely. Acme Advice Is Yours For The Asking.

ACME INDUSTRIAL COMPANY

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giving complete specifications and performance data. Type C is available in three capacities and easily adaptable to magazine, dial and hopper feed operations.



R. C. HASKINS CO.

2756 W. Flournoy St., Chicago



(Continued from page 56)

8. The probable manufacturing methods.
9. The possible delivery schedule.
10. The cost.

Product

The specifications and identifications of the product must be clearly outlined by the parent company, before it attempts to solicit contractors.

The rigid identification of all de-

tails of the product should remain unchanged from inquiry, through production, to disposition.

Specification should include data, such as: lengths of Beds, other size ranges, speeds, electric current specifications, numbers of Spindles, variations in tapers or auxiliary equipment specifications.

The product should be one that is developed free of engineering troubles or necessity of design changes during production.

The blueprint figures should have been actually used and checked by construction experience.

The product should be illustrated by blueprints and photographs. Blueprints should be much clearer than would be used in the home plant. Key symbols, or involved systems of delineation, must be simplified.

Tolerances for dimensions, shape and finish should be well expressed.

Standard data books should be equally clear and systematic.

The product should be exactly specified for limiting or range dimension and any variable components prominently marked.

In the case of complete machines, the data should be arranged for each customer's order; the identification of orders should be simple. Home factory practice should be revised, to give the contractor a graphical picture of the shipment program.

Ample supplies of blueprints should be available during manufacture, as well as assembly instructions, service charts and parts lists. The calendar cannot be saved by asking a strange concern to work to incomplete information.

It does not take a strange concern very long to locate defects that cause delay. Their suggestions and questions should be given prompt, positive attention.

Quantities

Invariably, quantities are difficult items to settle, especially on complete products that are at the mercy of the market. But this is no fault of the contractor; this problem cannot be passed on to him.

Contractors should know the exact quantities when studying the inquiry.

A definite statement should be made, and remain definite, and the same amount, within reason, all through the inquiry and production of the contract.

Quantities affect personnel, methods, equipment, cost, and deliveries; and, therefore, cannot fluctuate. If quantities cannot be determined, don't waste people's time these days trying to contract.

Do not ask for quotations on a thousand of an article; then offer an order for only 25. Do not ask for tabulated quotations on 1, 2, 5, 10, 25, 50, 100, 200, 500 and 1000 of an

SCHAUER

SPEED LATHES

are working for the U.S.A.

Speeds production more economically and more accurately, SCHAUER Speed Lathes are used for final finishing operations; **BURNISHING, POLISHING, LAPPING, and BURRING** of ball bearing races, headless set screws, gears, pinions, pulleys, spinning rings, screw machine products, wire drawing dies, and other similar products.

TYPE VA3B VARIABLE SPEED LATHE

Especially designed for precision lapping of gages at extremely low speeds (from 20 R.P.M. up to 4,000 R.P.M.) and for finishing operations, as may be required. In addition, there is plenty of power for rotating heavy work.



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Apex-Phillips Power Bits, for all electric, air and spiral drivers, are made from special shock-resisting steel, heat-treated and tempered to give maximum hardness, toughness and wear resistance.

Apex Power Bits for Slotted Head screws, for all electric, air and spiral drivers, range in size from No. 4 to No. 18 screws.

Apex Universal Joints have no projecting ears, screws or sharp corners to catch; can't overtravel their working angle of 35° and lock; are durable and smooth running.

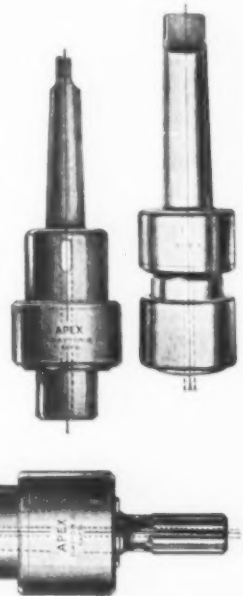
Apex Universal Socket Wrenches are available for all kinds of speed braces and extension shanks.

Apex Safety Friction Chucks maintain their friction setting... are not affected by end thrust...

can be used in any position... tools can be changed while machine is running... chuck slips before breaking tool—these features save time and money.

Apex Floating Tool Holders make possible accurately reamed and tapped holes on any type equipment... amount of float varies from a few thousandths to 1/4"... with Quick Change Drill collet, tools for series of operations can be changed without slowing down the machine... available in Extended Socket and Short Nose types for Morse Taper or straight shank tools.

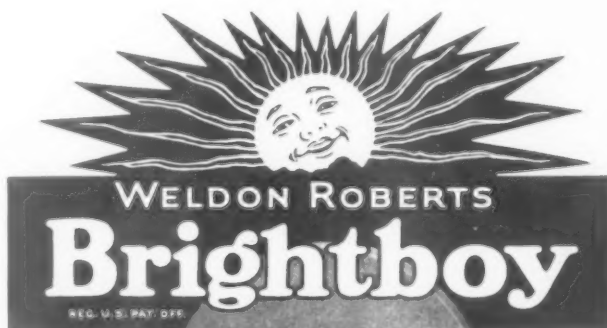
Apex Vertical Float Tapping Chucks are used for multiple tapping. Vertical float permits each tap to enter free and tap its hole true to size. Used for power feed, lead screw or hand feed tapping. Same collets and tools as Friction Chucks.



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Dayton, Ohio



* Write for descriptive matter



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BLOCKS

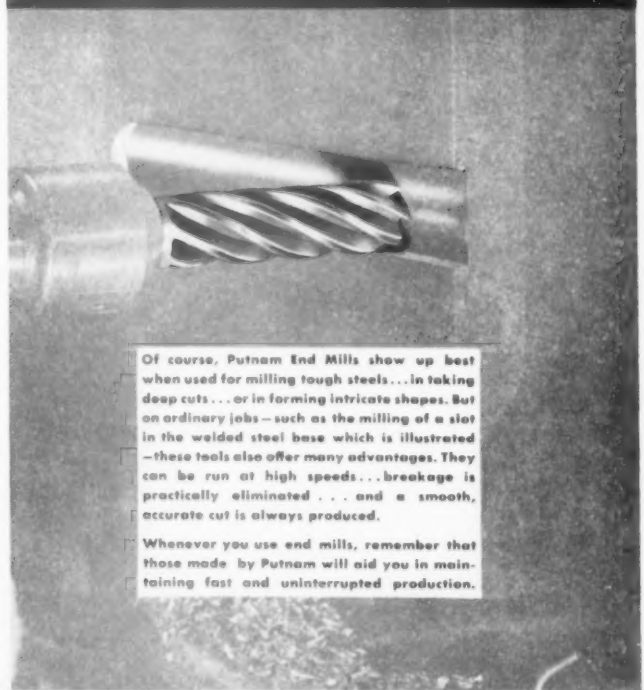
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Whenever you use end mills, remember that those made by Putnam will aid you in maintaining fast and uninterrupted production.

PUTNAM TOOL COMPANY

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article and expect cooperation or speed in returning a quotation. There are not hours enough today to work in that fashion. The situation demands decision and consistency of statement on the part of the home plant.

Materials

A prompt supply of rough material, so that the contractor can start work promptly, is a very essential factor in obtaining good service. It is best to

furnish the material, unless the contractor has a foundry or reliable supply source. Relations with your own sources entitle you to a service that a stranger cannot demand in these days.

Allow the contractor enough extras for a fair factor of safety for spoilage.

If there develops defective material, pay for the work done on it; it isn't the contractor's fault that the stock is bad.

Keep rough material specifications

in close agreement with established national standard and treatment practices—such as SAE or ASM.

If agreement can be reached on equal substitutes with the contractor, follow his practice—he is doing the work. Specify results, and let him supply the method.

The same comments apply to finish materials, such as ball bearings, electric motors, switches, vee belts, lubrication systems. If National Standards are not used, make an effort to apply these before trying to contract.

Use samples to augment specifications, to eliminate disputes between the contractor and inspectors on interpretations of standards. Give a tolerance on these, the same that would be given for the diameter of a shaft.

If strategic materials are involved, be sure that your priority will assure prompt delivery; otherwise one part made of unusual material may tie up a million-dollar contract for delivery.

Accuracy

The unusual speeds and performance of airplanes have lifted the tempo of this war, and will continue to lift it into unknown limits of engineering and science. The enemy has an accumulation of research and achievement, that commands respect. Only by improvement in armament products can his defeat be accomplished. This performance demands an accuracy in the product that is passed along to the producing machines.

Fits between parts must be more uniform, finishes better, fatigue scratches eliminated in surfaces, shoulders square, joints tight, and so on down to each machining operation that produces an accuracy that permits a design to house more horsepower per pound, or to fly a plane or fire a gun farther, faster and longer.

Machinery and gages must be built with less tolerance, so that the product will be made within the closer limits demanded by this high-speed war.

The blueprints and specifications must provide proper tolerance for dimensions, geometry, finish and treatment results.

A selling job should be done with the contractor, so that he understands and respects the reasons for these limits.

Specify tolerances at the start, before the methods are planned; plan



"Buy from Super"

is an increasingly common request found on Requisitions for Carbide Tipped Special Tools in many busy Defense Plants.

They know they can depend upon the accuracy and outstanding quality of Super Special Tools.

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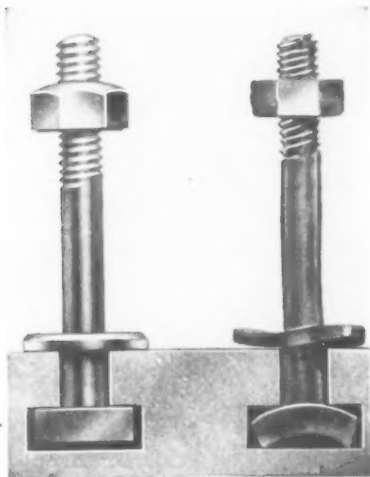
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FOR TURNING - FACING - REAMING - SPOTFACING - BROACHING
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MACHINES LAST LONGER WITH SMB T-SLOT BOLTS

The accuracy that was built into your machine tools is now more important than ever. You can help safeguard that accuracy in both tool room and shop by using SMB T-Slot Bolts.

Bolts of mild, untreated steel soon look like the one pictured on the right. You can imagine the damage such bolts can do to costly machine tools.

The Boyar-Schultz SMB Bolt, shown on the left is made of heat-treated Chromium Molybdenum Steel with head machined square with the body and presents a clean, flat surface to the upper part of the T-slot. Threads are strong and accurately cut. SMB Nuts and Washers are specially made for use with SMB Bolts.

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JANUARY, 1942

IS Your TAPPING Production up to these figures?

2400 to 12,000

TAPPED HOLES PER HOUR

That's the production range you can readily maintain on the

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FOOT-OPERATED
TAPPING MACHINE

2400 with the standard 2-spindle tapping head as illustrated—and all the way up to 12,000 with the Ettco-Emrick Multiple Heads which are available with spindles up to 12.

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Of special interest is the fact that you can get this high production on the Ettco-Emrick Tapping Machine with unskilled labor, because Ettco-Emrick design eliminates the human element from the actual tapping operation. All the operator does is feed the work and for this he has both hands free because the machine is foot-operated.

GET THE FACTS

BULLETIN No. 4 gives you complete details about the Ettco-Emrick Foot-operated Tapping Machine and the features of design that make possible this high tapping production with unskilled labor.

BULLETIN No. 3 gives full details about the Ettco-Emrick Multiple Heads. WRITE FOR BOTH BULLETINS TODAY.



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CHICAGO

The Famous **Ettco-Emrick** DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

methods to produce accuracy, and conduct manufacture safely.

Allow salvage operations, if practical. Do not scrap work blindly or arbitrarily.

Remember, the work is contracted because it is wanted quickly. Do not waste the time of the contractor for the sake of maintaining some blindly interpreted tolerance. Where a tolerance must be maintained, do not equivocate.

In selecting a contractor, make inquiry into his accuracy control system on his own work. Investigate his own inspection and standards system. Determine the availability of stand-

ard gage blocks, comparators, assortments of plug gages, micrometers, dial indicators, surface plates, straight edges. Determine if there is an orderly tool room and a gage and micrometer standards surveillance system. The whole shop should be clean, free from dirt, rubbish, scrap and disorder.

Remember one of William S. Knudsen's recent comments, "No Bullet is better than a bad Bullet. Watch the quality."

Disposition

After the product has been delivered and accepted, it should be prepared for shipment and delivered

promptly. If successful in obtaining prompt production, it should be passed speedily into the manufacturing lines, without delays in obtaining shipping papers or releases.

The product should not remain around the shipping room, awaiting some last minute decision or a red-tape inspection from some agency.

If careless with the calendar at this time, the producing personnel will begin to question the sincerity of your haste, and falter and cause delays. Morale maintenance at this point is important.

The contractor and his staff usually are proud of their work, and the part they are playing in this program. Develop their favorable attitudes to speedy deliveries, by showing that their efforts are valuable and put to immediate use.

Rail or truck routings, boxing, crating, rust protecting, car blocking, are all important at this time, as real delivery is effected by placing the machine in quick use at its destination.

Transportation hazards require better precautions in packaging. Do not lose the time gained in production by careless shipping.

Personnel

A concern may have the finest equipment, buildings and tools, but will be of no assistance in this program, if there are weaknesses in the personnel of the organization. The management may be patriotic, aggressive and cooperative; the shop organization may have competent workmen; but if there is a lack of coordinating force and general production supervision, work will be delayed between operations, vital parts lost or missing at assembly, and another defeat registered for the calendar.

In the last analysis, it is people that make the machines run and go together. If the proper people are lacking, the program won't work.

As quantities do not run too large in machinery building, the work is constantly changing from set-up to operating, to another set-up. This requires a more intelligent and skilled personnel than that for repetitive manufacture. Workmen must be individually responsible for quality and performance of their assignments and safe in their decisions.

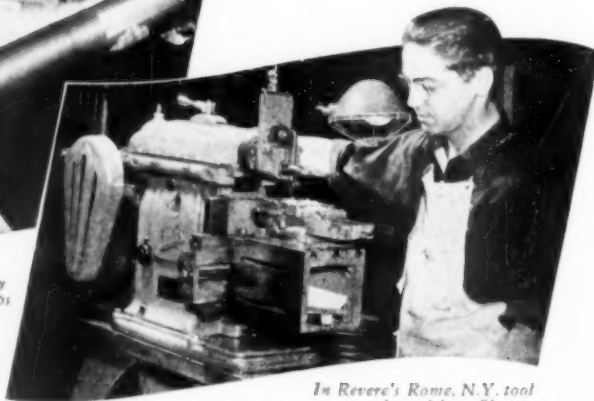
Principal attention should be paid

How *Atlas* SERVES THE NATION REVERE RIDES AGAIN!



Photo by
U. S. Army
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"Keep 'em flying — keep 'em firing!" Once again that famous name "Revere" plays an important part in an America at war. This time it's a modern, behind-the-lines role as Revere Copper and Brass Incorporated piles out the shell parts for Uncle Sam. The accurate rotating bands that guide the shells are among the important shell parts made by Revere.



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Mark hardened parts, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides — quickly — plainly.

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**For Compression, Tension, Torsion,
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for service, laboratory and inspection spot testing. Dial Indicator and Electric Signal equipment available for close reading. Electronic Control equipment available for automatic indication of results.

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Tester illustrated
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Special die cut stamped wrenches of any size or shape can be had at a comparative cost of 6 to 8 hand made wrenches. The lowest possible die cost assured for any required design.

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QUICK FACTS: Special wrenches from 1/32" to 5/8" thick up to an overall length of 20" requiring a blanking pressure of 500 tons can be supplied to your specific custom made requirements in small lots.

*Write for full details and representative samples.
Tell us your special wrench needs.*

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to the production and inspection organization. The latter must be under a separate administration of the management than that of the former. Concerns, previously organized to allow producing workmen to inspect their own manufacture, will find it necessary to resort to inspections between operations by an independent group.

Parts produced to engineered tolerances will usually assemble properly. If the personnel of the plant are not minded to produce to tolerances,

the assembly and (in turn) the calendar will suffer. It is important to understand the attitude of the contractor's personnel in this respect.

Inspection

If thorough inspection between operations is used, troublesome conditions can be checked before too great a loss of time occurs. A contractor's own inspection should be sufficient on parts manufacture if his inspectors are sincere about their du-

ties. The ratio of supervision, inspection and producing personnel, should be at least 1 supervisor and 1 inspector for every 6 to 10 producing hands, depending on quantities manufactured and the experience of the help. One successful plant is able to operate its inspection on a one to 17 ratio; but their supervision is much closer, and the plant is staffed with veterans. The supervision and inspection staff must be augmented when new work is started. There must be plenty of consideration given the start of each new operation by supervisor, inspector and workman. If the floor inspector lacks time to properly check the first piece, due to too many operations to watch; if supervisors let men run along by themselves, set their own speeds and feeds, rig their own set-up and tools; everything is sure to go wrong, especially if operators are in the trainee class, as they cannot be trusted beyond what they have been taught or actually done correctly.

After detail operation supervision, comes the coordinating of effort necessary by the production department. They must watch the calendar; keep the work from remaining idle between operations and inspections; see that replace parts, salvage operations and shortages are processed promptly; keep production balanced and in sequence; see that stock rooms are in order; see that the receiving department properly checks material sent in by the home plant; and double checks the home plant on its shipments, replaces and shortages.

Equipment

Equipment surveys divide into five classes:

1. General plant arrangements
2. Machining Equipment
3. Assembly Equipment
4. Special and Tool Equipment
5. Gage and Inspection Equipment.

The weight and proportions of the proposed product should determine the type of industrial real estate that should be available for its production. Facilities that should be investigated are receiving, shipping, handling, assembling, sizes and capacities of elevators, doors and floors, arrangements of departments and store rooms, dampness of premises, light, heat, illumination, power, general cleanliness, condition of paint, window glass, safety and

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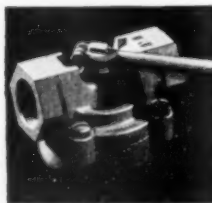
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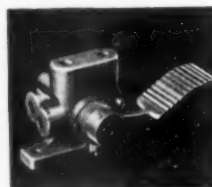
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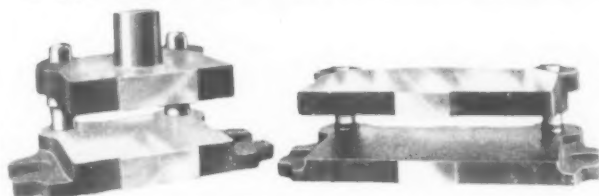
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or Adjustable Cushion,
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Because specifications for NOPAK Air or Hydraulic Cylinders vary with every order it is impossible to carry finished cylinders in stock. However, it is usually possible to ship standard brass tubing cylinders, in ordinary sizes, within two weeks from date of order.

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Save  Money!

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Standardized means that the various units are interchangeable, are in stock ready for assembly to your specifications and the complete Die Set available for prompt shipment. PRODUCTO Assembly plants at Bridgeport, Detroit and Cleveland are at your service on Die Sets and Die Makers Accessories, such as Dowel Pins, Springs, Screws and Stripper Bolts.

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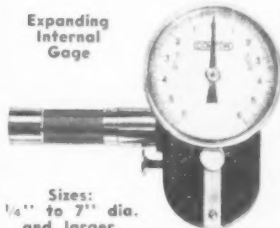
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Comtorplug gives automatic accuracy in gaging bores to fractions of .0001". A favorite with government and private inspectors, it is more and more being sent out into the shop to give the operator utmost control of his machine. Comtorplug is practical for this because it is a rugged shop tool and because even a green hand can use it with split-tenth accuracy. Shows not only size, but also front or back tapers, out-of-round, bell mouth, barrel shape, etc.

Request Bulletin 27

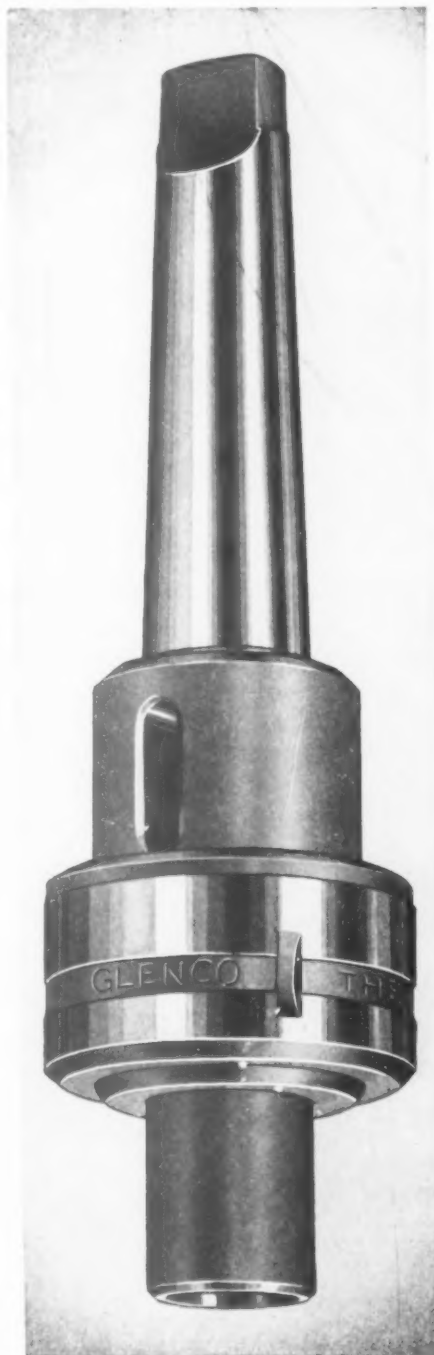
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FLOATING TOOLHOLDER

Corrects Machine Tool Misalignment By
Producing **TRUE** and **ACCURATE** Holes



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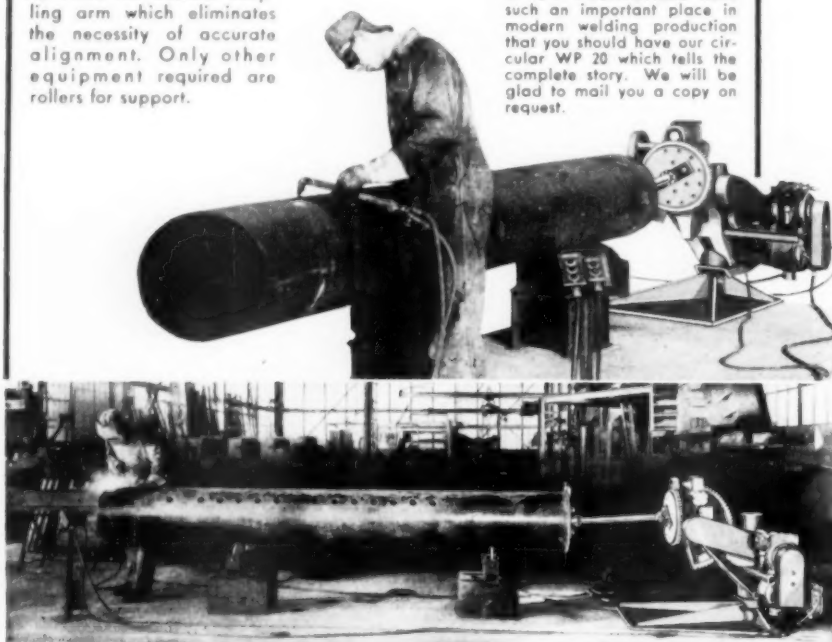
MICHIGAN

HOW WOULD YOU DO THIS JOB?

● For sheer economy in handling there is no faster, safer or easier way of flame-cutting or "down-hand" welding of heavy tubular shapes, than turning them under controlled speed with a C-F WELDING POSITIONER.

● Note the flexible coupling arm which eliminates the necessity of accurate alignment. Only other equipment required are rollers for support.

● C-F POSITIONERS have such an important place in modern welding production that you should have our circular WP 20 which tells the complete story. We will be glad to mail you a copy on request.



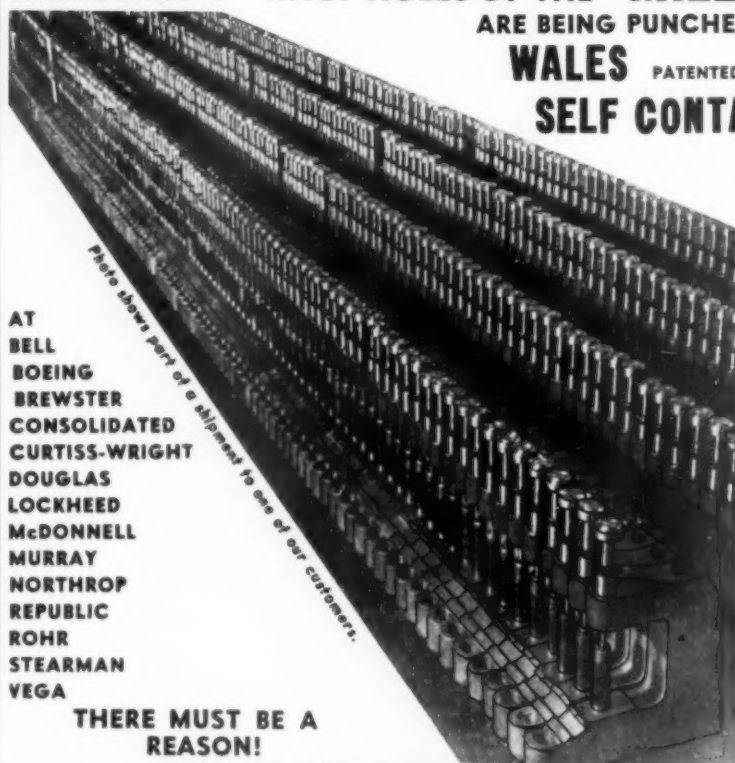
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THERE MUST BE A
REASON!

FOR FURTHER INFORMATION WRITE
THE STRIPPIT CORP. 1200 NIAGARA ST., BUFFALO, N. Y.



SUBCONTRACTING

sanitation of premises. The Internal Transportation and its equipment should have a special study. In assembly, the condition of the atmosphere to prevent dirt scratches on finely scraped surfaces, may require isolation of the assembly floor from contamination. The smoothness of operation of travelling or Jib Cranes; steadiness of assembly floor; freedom from vibration; influence of internal transportation; and in some cases, external, such as vibrations from railroads, should be taken into account. Location in respect to other plants and industries, especially those involved with chemicals that produce fumes that would cause rusting of metallic parts, should also be considered.

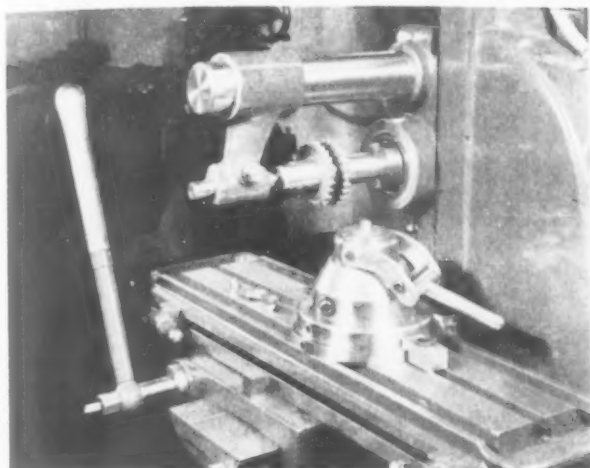
In the manufacturing departments, investigate the age and condition of the machine tools; Planers should be chatter free; Millers, Radial Drills and Horizontal Boring Mills should have Spindles and Tables true and well-aligned. The more modern the drive, the better; but you can work with cone and belt driven tools, if in good shape and not too light. Bore Grinders must be in good condition, especially for grinding taper holes in Spindles. Investigate the relative location of heat treat Turret Lathe and Grinding Departments, Planers, Boring Mills and Painting to Assembly, Tool Cribs, Cutter Grinding and tool maintenance, in relation to departments served.

Assembly

Some assembly features will be reviewed with general plant, but detailed requirements should be checked for surface plates, indicators, basic aligning bars and bushings, lighter crane arrangements for scraping, and unit assembly operations. The condition of cranes is important, as heavy loads must be lowered into position in minute increments. Poor switches, loose gears, or tackles, may allow an accurately scraped precision slide to drop an excessive distance on a Bed and damage both parts beyond repair, again losing calendar. The assembly of anti-friction bearings, and the instruction for properly doing this work, has been greatly simplified by the foresight and extensive cooperation of the anti-friction bearing manufacturers, who have greatly assisted contractors by sending skilled instructors.

THE TOOL ENGINEER

NEW COLLET INDEX FIXTURE



For Rapid Production on Second Operation Work Mounts on Face Plates or Tables

Has Wide Application on Milling Machines, Lathes, Internal Grinders, External Grinders, Drill Presses, Gear Shapers and Screw Machines.

Accuracy Guaranteed. All Parts Hardened and Ground. Two Sizes — 1" and 2". Standard W. & S. Collets or Can Be Furnished to Fit Customer's Collets.

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THE NEW CLEVELAND No. 1

VERTICAL MILLING MACHINE

Built for the exacting needs of the tool room with a ruggedness making it adaptable for heavy-duty production.

It is a completely new machine designed and built with these requirements in mind.

Features

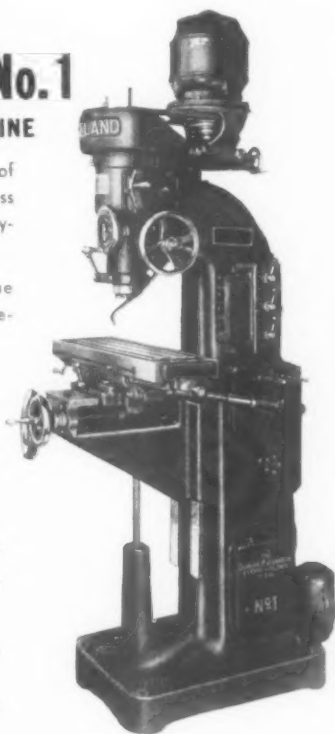
CAPACITY:
Longitudinal feed—18"
Cross travel—8½"
Vertical travel—16"

SPINDLE SPEEDS:
Choice of two ranges
(a) 12 speeds — 100 r.p.m. to 1750 r.p.m.
(b) 12 speeds — 200 r.p.m. to 3450 r.p.m.

TABLE:
Working surface—8" x 32"
Twelve feeds with range from .6" to 12½" per min.

FLOOR SPACE:
36" x 42" front to back x 87" high

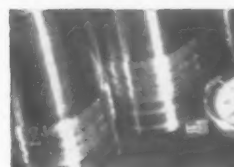
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THE SOMMER AND ADAMS CO.
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ON THE NOSE!



Since Taft-Peirce first provided the gages for the original educational shell orders, the capacity of the Taft-Peirce Gage Division has doubled, redoubled, and still continues to grow. Today, throughout the defense industries, costly errors are being avoided, precious time is being saved, accurate size-control of production is being maintained with Taft-Peirce Gages and Gaging Fixtures. One of the few



complete gaging systems, the Taft-Peirce line includes all standard types. Any special types may be produced as ordered. For the full picture, write on your letterhead for a copy of the Taft-Peirce Handbook.

The Taft-Peirce Mfg. Co., Woonsocket, R. I.

GOLCONDA SINGLEPOINT Diamond Tools

Designed

BY PRECISION TOOLMAKERS FOR OVER 18 YEARS

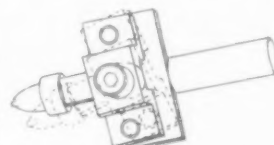


Users of Golconda Diamond Tools value our primary functions—tool designing and tool making—as more important than exclusive diamond importing.

Golconda makes diamond dressing tools to accommodate every requirement. A SPECIAL FORGED STEEL SETTING found exclusively in Golconda SINGLEPOINT tools accounts for their superior performance. For contour dressing and wheel shaping on tap, thread and gear grinding, SINGLEPOINT tools are shaped to various angles or set with naturally pointed octahedrons.

SWIVEL FIXTURE

This practical device, used with square shank SINGLEPOINT tools, provides the necessary drag angle to create sharp cutting edges for efficient dressing and truing operations.



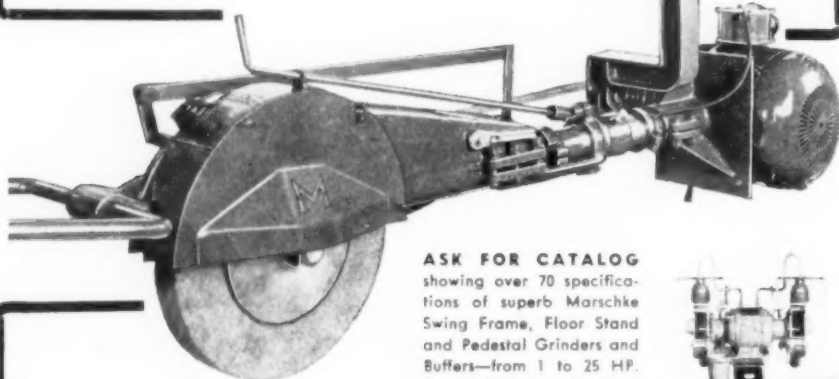
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GOLCONDA DIAMOND PRODUCTS CORPORATION
2212-16 W. ARMITAGE AVE. CHICAGO, ILLINOIS

EXTRA EFFICIENCY, EXTRA DEPENDABILITY with

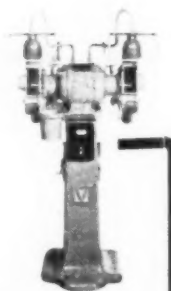
MARSCHKE Swing Frame Grinders get more work out of expensive abrasive wheels, **cut off hand grinding costs**, because they give three correct, controlled wheel speeds and true, smooth wheel rotation. They save time by carrying the wheel to heavy work pieces. Highly maneuverable and providing unobstructed wheel visibility, they enable the operator to turn out a big day's work.

MARSCHKE SWING FRAME GRINDERS

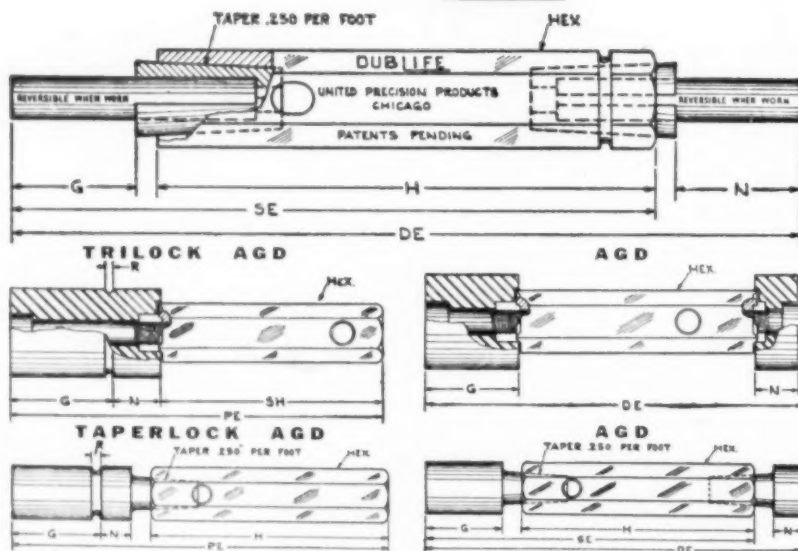


ASK FOR CATALOG showing over 70 specifications of superb Marschke Swing Frame, Floor Stand and Pedestal Grinders and Buffers—from 1 to 25 HP. Each built to machine tool standards. Eighteen features of superiority to give long dependable service under toughest, grittiest operating conditions. Write today.

THE MARSCHKE LINE
VONNEGUT MOULDER CORPORATION
1820 Madison Ave. Indianapolis, Ind.



The New DUBLIFE Gauges



Illustrated above are the new improved DUBLIFE Gauges manufactured exclusively by us. The handle is made of hexagon material with bronze tapered collet which locks around the plug as it is driven into the handle. The plugs are reversible, thus giving "Dublife". Quick delivery from stock on gauges .030" to 1.000". Specify "UPPCO FINISH", "The last word in finish".

Write for catalog showing DUBLIFE and AGD Gauges, or use mailing card in this issue of THE TOOL ENGINEER.

"PLUG GAGE SPECIALISTS"
UNITED PRECISION PRODUCTS CO.

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CHICAGO, ILL.

SUBCONTRACTING

who have not only taught the contractor's mechanics proper installation methods, but have called again and checked work that is in process for some period. The constructive criticisms and suggestions of these field men have assisted assembly, inspection and production personnel in the accomplishment of this precise and difficult operation.

As machinery assembly involves operations beyond those of merely slapping parts together, equipment for functional testing and inspection is essential for the construction of unit assemblies, general assembly and timing operations, testing of gear cutting or thread cutting accuracies, testing hydraulic systems for pressure and freedom from leaks, and testing high speed units for balance and freedom from vibration. The design of this equipment may coincide with the inspection equipment; but be sure that the workman has as good, if not better, devices than the inspector for such checking. Multi-voltage electrical panels for checking various voltages of customer's motors are essential in a program for complete machines.

Special and Tool Equipment

Standard tools of a perishable nature, such as drills, reamers, taps, etc., should be furnished by the contractor. Special taper reamers, large taps, gear hobs should be furnished by the home plant. An adequate supply of cutting tools must be prepared weeks in advance.

Items of universal application, such as chucks, collets, vises, quick-change drill chucks, should be a part of the contractor's equipment. If these are not available at the time of survey, the contractor should obtain these promptly after receiving the contract.

The contractor must maintain the cutting tools, and keep these in proper condition for use by his personnel, especially if many inexperienced hands have been recently employed. Too much scrap occurs from trying to tap a Class 3 hole with a tap that should be used only for Class 2.

Reamers or milling cutters, improperly serviced and mounted, sharpened with improper grinding wheels, are common sources of annoyance. The tool service and sharpening departments need constant surveillance, as

CLAMPING

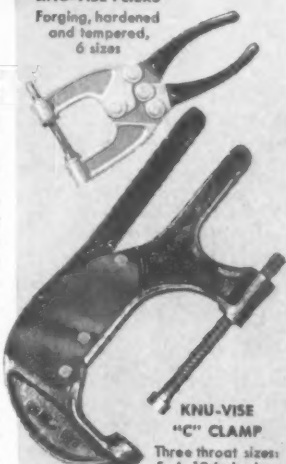
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and instant release*

KNU-VISE TOGGLE ACTION CLAMPING FIXTURES

Once set for a job, Knu-Vise clamps and pliers can be put on and released instantly—no time is consumed in screwing to apply pressure and unscrewing to release clamp. Zip! and clamp is applied. Zip! and it's off. Initial setting of pressure remains as long as required.

Bring real efficiency to plants where parts must be held together while drilling, welding, and other operations must be performed.

KNU-VISE PLIERS
Forging, hardened
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6 sizes



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"C" CLAMP
Three throat sizes:
5, 6, 10 inch. Jaw
swings clear of
work when re-
leased

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"Tuf-Face" steel dies ruggedly designed for extra service life for marking your products, whether round, flat, concave or convex surfaces . . . with trade-marks, patent numbers, special lettering or designs.

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SEND FOR CATALOG No. 146-B

This new catalog illustrates and suggests many ways in which products can be marked with stamping, roller and embossing dies, marking machines and special devices. Write for this interesting booklet.



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JANUARY, 1942

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CERROBASE (Melting Temp., 255° F.) For reproducing master patterns, models for electroforming, engraving machine models, proof casting for forging dies, etc. Perfect reproduction of intricate detail.



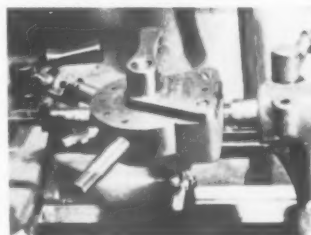
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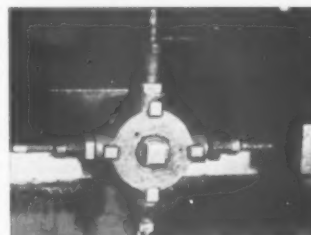
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THE ultimate of efficiency is doing even the smallest job in the least amount of time yet doing it well. A multiple operation QUADRUPLEX TAILSTOCK TURRET head eliminates that small run nuisance by doing on an engine lathe what would ordinarily be done in a tool room or on a turret lathe with a costly set-up. A four position micrometer set QUADRUPLEX LATHE STOP, by a mere flip of the finger, gives you accurate distances for work being done with the compound.

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**DEPENDABLE
HIGH QUALITY
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Because "quality first" has always been the rule with Lufkin, there is today no let-up in our efforts to supply you only the best Precision Tools that skill and experience can build. You can depend on that—and you can depend on the readings you take from your Lufkin "Mike." What's more, you can get those readings quickly and easily. For complete details see your dealer and write us for Catalog No. 7.

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TAPES • RULES • PRECISION TOOLS

SUBCONTRACTING

it is impossible to mill flat faces on gear boxes if the cutters are not sharpened in a precise manner. Too many contracting troubles start back in the cutter and tool sharpening departments. It is folly to buy new machine tools, with preloaded Spindles, and furnish cutters for use in these tools that are sharpened on an antique cutter grinder, or that burns fine cutting edges with a wrong grinding wheel. This same condition can be magnified ten to one, as far as necessary precautions are concerned, when the subject is changed from high speed steel tools to carbide tools. If the potential contractor cannot maintain good cutting tools, the calendar is lost before the work starts. A contractor cannot afford to send tools into the shop to work on another manufacturer's property and material unless test cuts have been made, and basic quality assured. Planning, supervision and inspection of cutting tool maintenance cannot be overemphasized. The day of workmen, especially new workmen, doing extensive tool servicing is over; it requires the best skill, experience and conscience in the plant.

Scraping

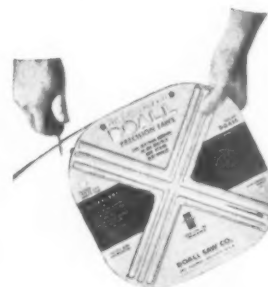
One of the quandaries of potential contractors concerns scraper hands. Many plants do not have an abundance of men, trained in this art. At the bottom of building a force of scraper hands is equipment. There must be some basic master plates and straight edges that are made of time-seasoned castings, basically prepared and maintained for final reference only by the 1-2, 1-3, 2-3 system. From these can be developed sets of working masters, and sets of working plates, or straight edges, that are rescraped every 15 to 25 parts, to maintain accuracy. To build accurate 1941 machine tools, scraping is needed; there is no use wasting time with amateur substitutes. It is essential to start at the bottom and build correctly on a secure foundation. After the masters are available, the actual scraping tools require proper grinding, and especially stoning. This operation is another precision step that commands respect and serious attention. It is not difficult accomplishment, if a time-tested rule is obeyed. Scraping equipment should not be supplied with the idea of tooling for



**Easy as PIE FOR
DoAll SAWS**

Yes Sir, they go right through any kind of metal or alloy with a speed and smoothness that is astonishing.

Above parts, formerly cut by hand, are now sawed on the DoAll without blueprints, for an automatic paper file folding machine at Linder Mfg. Co., Minneapolis. Savings in time are tremendous, according to Mr. Linder. And, not satisfied with cutting ordinary metals, DoAll Saws do a real job on such tough ones as cold rolled nickel, laminated low carbon sheet steel, Neoprene, aluminum alloy, bronze, semi-steel castings, etc.



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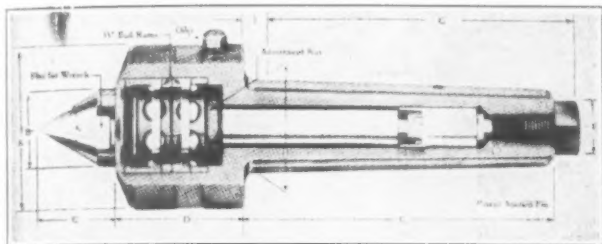
The Improved Nielsen Live Centers

LOAD CAPACITY—200 TO 40,000 LBS.
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HAVE ADJUSTMENT TO TAKE UP WEAR
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LAWTON, MICHIGAN

A Tapping Machine

*that meets
your needs*

... for highly specialized
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The new Proconier Universal Tapping Machines are versatile enough to meet all your needs. The features that make this possible include:
1. Four Speeds, ranging from 390 to 2050 R.P.M. efficiently handle jobs for which conventional high speed tapping machines are inadequate.
2. One machine handles tap sizes from No. 2 to 1/2" through two interchangeable heads. 3. Extra long Spiral Compensating Springs conveniently located, with wide range hand-screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF OPERATOR.

Increased Output—More Accurate Work

The new Proconier Universal Tapping Machine is so designed that it actually allows the tap to establish its own lead. There is nothing more accurate than the tap itself in thread cutting—so maximum tapping efficiency is attained where the tap is free to establish its own lead in cutting the thread. This means more accurate tapping with every thread uniform, greater production with less spoiled work tap breakage.

SEND FOR BULLETIN giving full details, description and prices on the full line of Proconier Universal Tapping Machines.

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Send me Bulletin on: ☐ High Speed
Tapping Heads ☐ Pru-Grip Tap Holders
☐ Universal Tapping Machines.

Name

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JANUARY, 1942



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Mallets and Hammers are
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Genuine Java Water Buffalo Hide will not split, crack or break. The hydraulically compressed heads of Chicago Rawhide Mallets and Hammers are safe to use and safe to handle. Hammers have replaceable faces in malleable iron heads. These economical tools are made in sizes and weights for every purpose. You can get them through your dealer.

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Hydraulic Engineers, you can pick from a complete line of standard and special RACINE Valves those controls exactly suited to your requirements. Balanced piston sleeve type valves have smoother wearing surfaces which means longer service life to you. Ask for free information on RACINE Valves or on RACINE Variable Volume Hydraulic Pumps. Our competent representatives located near you will be glad to discuss them and work with you to lay out working circuits without obligation.

RACINE TOOL AND MACHINE COMPANY
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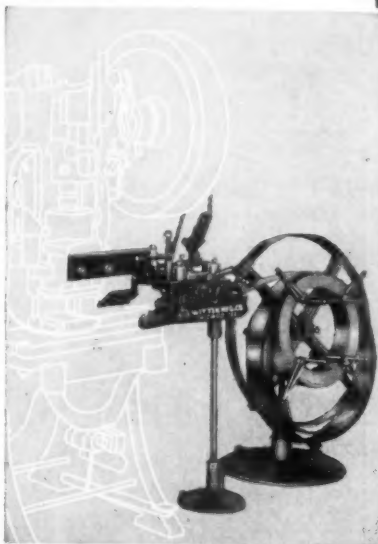
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for Any Make or Size Punch Press

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Wittek Adjustable Reel Stands provide automatically expanding coil holders that center the coil and assure maximum production by eliminating looping, tangling and backlash of stock.

If your production problem involves feeding coiled stock to punch presses, it may be solved by consulting us. Your inquiry will be given immediate attention. Send for complete descriptive catalog.



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fairness in price.**

Write or call us regarding our
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DUNCAN
TOOL DESIGNING CO.
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PHILA. PENNA.

—SUBCONTRACTING—

a corrective operation in production. See that the corrective work is done on the Planer or Miller, and use the scraper to develop the final peculiar finish and alignment that scraping is used for. Power scraping is needed for corrective work only. Grinding can be satisfactorily substituted for scraping on non-sliding surfaces.

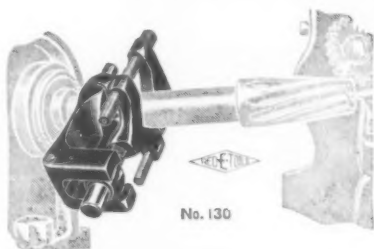
Gage and Inspection Equipment

Mentioning the employment of many new hands, emphasizes the need of more extensive gaging equipment, especially gages of a measuring or indicating type, rather than of a solid GO and NO-GO Type. Quantities in this machinery work do not run large enough to risk all gaging on a GO and NO-GO basis. Workmen need to take contact cuts, trial measurements and calculate the stock removal to the final size, knowing that the cross feed screw thrust is rigid, the backlash the right way, and the dial thimble reliably locked. Wear of tools and wheels in this type of work demands constant checking and compensation. The places that permit working with a locked slide, a fixed set-up and semi-automatic operation are at a minimum in machinery building. Therefore, the working and inspection gages should be furnished to suit these conditions, and a standards surveillance system provided to maintain this method. A sound approach for a new contractor to follow is to assume the home plant tolerances are to be cut in half, gage and provide methods to meet this requirement. More money and time will be saved by these basic precautions than can be expended by the little extra time invested in closer manufacturing accuracy.

Special Gages are difficult to obtain at this time; actually, better arrangements can be rigged with standard indicators, size blocks and surface plates. Special size plug gages can be made by the contractor, particularly if his grinding equipment can grind the shafts and sleeves needed in the product manufacture. The home plant can check and certify close limit plug gages, to assure basic dimensions. Considerations should always be given relative shop temperatures for all comparisons of this type.

The type of Gage supplied must be in keeping with the tolerance concerned. If the thousandth is being

NO LOST MOTION



HERE

When indexing work held between centers the RED—"E" milling machine dog assures accurate spacing with **no lost motion**. A sliding ball and socket universal joint also eliminates binding or cramping with accurate indexing without the use of shims.

*Investigate now—
write for catalog.*

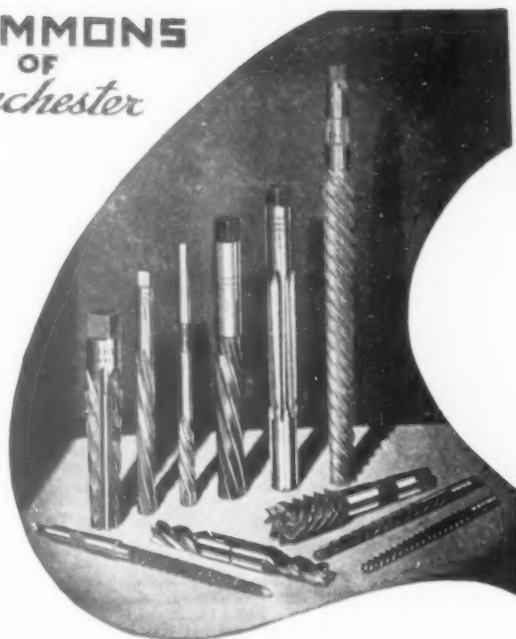
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IRANISTAN and R. R. AVES.

BRIDGEPORT

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GAMMONS
OF
Manchester



PRODUCTION TOOLS

ORIGINATORS AND
MANUFACTURERS OF HELICAL
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THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN.

DIAMONDS for Defense



Pat.
Pend.

BIG-HED "Loc-Key-Set" (Pat. Pend.) Nibs always provide better dressing and truer, sharper wheels because they dress cooler, permit closer tolerances. Diamond cannot shift and slug will not slip because new Loc-Key-Set feature locks diamond-holding slug to Nib with unique internal key construction, permitting micrometer control of tool pass.

BIG-HED "Loc-Key-Set" Nibs are now in stock at our local service and stock branch. Loc-Key-Set construction now used in all D.T.Co. Diamond Dressing Tools. Call or write for details.

DIAMOND TOOL COMPANY, Not Inc.
928 E. 41st Street
CHICAGO, ILL.

CUT SET-UP TIME 75% WITH ADVANCE T-SLOT CLAMPS

OLD
WAY
8 min.



NEW
WAY
2 min.

For use on the T-slots of jig borers, slotters, lathes, milling machines, drill presses, planers and grinders.

- Replaces the bolt, the strap and the jack in the job set up.
- Requires less clamping.
- Made of high-grade alloy steel.
- Direct clamping secures perfect accuracy.
- Gives more working surface.
- Protects work from marks.

ADVANCE MACHINE WKS. 3727 Weisser Pkwy.
FT. WAYNE, IND.

FlexoiD TOOL HOLDER Universal Head

"IT'S ALL IN THE
TOOL



and ONE
TOOL DOES IT ALL"

No need of right, straight or left-hand shank tool holder when using **FlexoiD TOOL HOLDERS**. No change in centers necessary when resetting cutter. All hard alloy steel. Tool, Rexalloy bit and wrench included. Five sizes, 0 to 4.

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30 DAY TRIAL



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TRANSMISSION CO.**

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RUTHMAN GUSHER COOLANT PUMPS

STRAINERS NOT NECESSARY

No metal-to-metal contacts . . . not injured by small chips and grit . . . **no strainers necessary.**

A complete line of **Gusher** Coolant Pumps to speed your jobs. Write!



Model 2-P3

P3 models are available in immersed type (1-P3), flange-mounted with internal discharge (2-P3), flange-mounted with external right hand discharge (3-P3), left hand discharge (4-P3). All above are available in short and long models, that is, for two maximum high water lines.

Pat. and Pats. Pending.

THE RUTHMAN MACHINERY CO.
1815 READING ROAD, CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

YOUR DEFENSE DEMANDS

**MORE and
BETTER BORES**



BEARING-IZE

with the

COGSDILL PROCESS

TO IMPROVE YOUR PRODUCT

at REDUCED COST

"HOLE" ENGINEERING SERVICE

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DETROIT

MICH.

SUBCONTRACTING

split minutely, gaging equipment should split the tenth of a thousandth, as far as basic accuracy is concerned. As an example: Do not expect to successfully install ball bearings in holes bored to calipers. Conversely, there are places in machine construction where plenty of liberty can be taken and visual gaging equipment is sufficient. Judgment must be used in every case. No blanket rules can apply.

Methods

The home plant should furnish a set of method sheets or operation lists, which are related with the general and special shop tool equipment. The contractor should translate these into terms to match his own plant and system. As methods will be somewhat parallel, such as planing, milling, drilling and grinding, little change will be needed in the actual wording of the lists; but there must be an interpretation of the meaning of the same term in each plant. In other words, both places must talk the same method language, so that the processes will arrive at the same final results of accuracy and successful assembly. As a rule, the contractor may be required to improve the accuracy of methods all along the line. Where the machinery manufacturer can cut corners, the contractor generally cannot, and must develop accuracy by additional operations, tooling and gaging. It is on these studies and decisions in processing that the whole success of the program rests.

New operations, such as filling and painting, scraping, honing and lapping will present problems of training for which the home plant must offer assistance in many cases. If properly organized and conducted, none of these will be serious, if started early in the schedule. In many instances, 100% inspection and layout of rough castings must be included as an operation, before any machining is done, so that personnel that are unacquainted with the work can have reliable starting lines and centers. The method sheets must be plainly prepared always, with the idea that strange workmen will arrive at a different meaning if the method is not clearly specified for them. Sequences are important with respect to accuracy, roughing out work, allowing for release of strains



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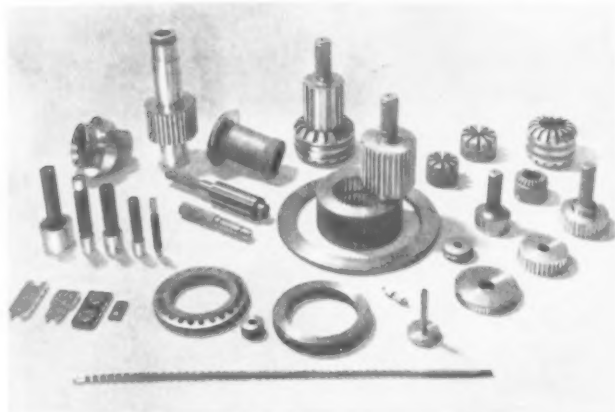
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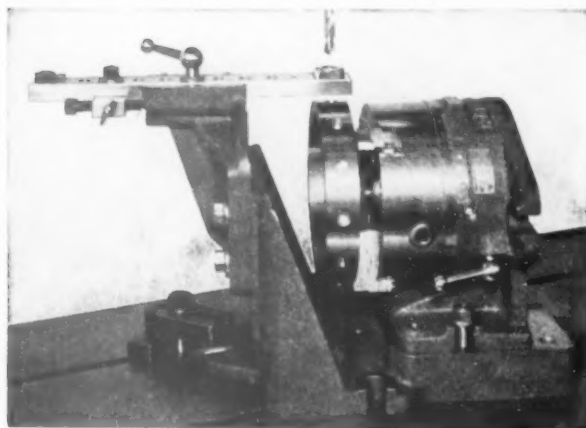
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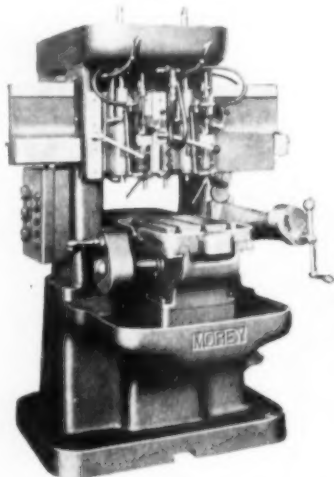
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—SUBCONTRACTING—

and performing operations in proper order in respect to the development of locating points and final accuracy. Everything needed should be specified on the method list, especially heat treating, cleaning, inspection, leak testing, paintings, seasoning, shipping in its proper order. The methods selected are the "marching orders" for all of the organization, shop men, tool makers, tool sharpeners, production expeditors, time study, foremen and inspectors. Always be sure to study the part enough to process it by the safest and best way.

Delivery and Costs

These will be considered jointly. The foregoing three (personnel, equipment and methods) steps will, after study, produce some idea to the home plant what can be expected in consideration of quality and accuracy. Also, these furnish the other two answers to the inquiry, namely: cost and delivery. Tool Engineers recognize the balance that must be maintained between quality, delivery and cost. In contracting work, delivery and quality are paramount; therefore, higher costs must be expected and granted. This is no time to expect money bargains if the other two items are to be assured. But cost is a clue to delivery; and if the cost is quoted too high, invariably the delivery will be too long. Further, it is essential that the potential manufacturer commit himself to, and be morally bound, to maintain the deliveries and prices offered in the quotation. The open order, or hastily placed contract, actually wastes time, as it does not require the preliminary study that all of these details demand. It is not safe to contract extensively on an open order, with an uninitiated concern. After a period of acquaintance, it may work; but as a starter, a quotation of cost, quality and delivery is the only business-like calendar protecting procedure. If a potential contractor does not know about modern shop practice to prepare a reliable quotation, eventually the work will not be done as quick as it should. There may be cases where a trial order is needed to check border-line cases of accuracy of equipment, or give confidence to shop personnel; but the probable results will be immediately evident during the trial. With all of the data that

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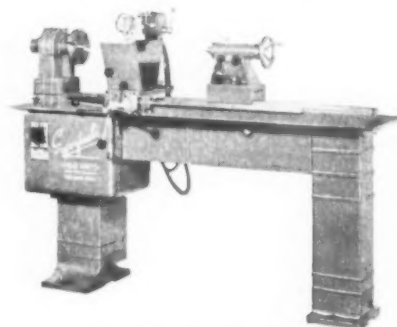
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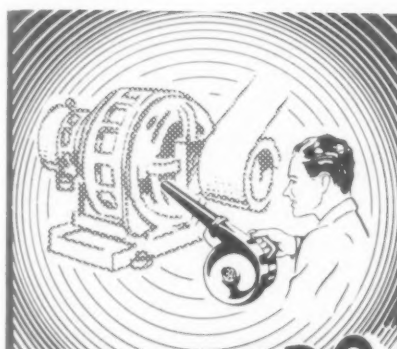


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SUBCONTRACTING

has been published for the last 20 years on shop practice and management, the education of industry in general should be such in this age and day that it can look around and, if necessary, analyze the other fellow's problem and tell what can be done with it with reasonable accuracy. It may be necessary to revise cost formulae and do some educational work with the company auditors and directors; but there is no mystery in present-day production costs or delivery rates that cannot be fathomed by any progressive manufacturer.

Conclusions

After listing methods, apply time study standards to each operation. Totals will show the cost in hours which should be the basis of the price quoted. Similarly, these same hours, tabulated by operations, should show the equipment loading as far as calendar days are concerned, and act as a predictor of the number and type of personnel to be engaged, the amount of tool supply, grinding wheels, service equipment, coolant and all the various shop supplies that are needed to make the program a success. This also charts the first moves to be made when the order is received, gives the treasurer an idea how the payroll will expand during production, and when the returns from shipments should be available. This may sound like a mountain of details; but there will be many besides these that are unforeseen in any program. The home plant can show most of these from its own record. If an attempt is made to proceed without charting the course along these basic considerations, there will be unnecessary delays each day.

The accomplishments desired of the machinery industries are not easily defined. With the possibility of a military collapse among any of the peoples now receiving our material assistance, and with our own entrance into the war, there is the danger that deliveries may be continually shortened by causes not of our own control. Therefore, it behooves each individual in this program to do more than expected, especially by saving the calendar days, through planning and initiative in furnishing the machines to make planes and guns to keep the boys now engaged; flying and shooting, faster, farther, longer.

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BALTIMORE—Jan. 7. 8:30 P.M. Sears & Roebuck Auditorium, North and Hartford Aves., Baltimore. F. A. Kelly of the Cleveland Twist Drill Co., will show a movie on Uses and Abuses of Twist Drills. Reservations: Leslie MacGregor, 501 Hollen Road.

DAYTON—Jan. 12. A combined meeting with the Dayton Engineers Club on the subject of Hydromatic Transmission with Mr. Carnegie of the General Motors Transmission Plant as the speaker.

DETROIT—Jan. 8. Dinner 6:30. Technical Session 8:00 P. M. J. T. Wilson, General Electric X-Ray Corporation, will speak on the subject of X-Ray Defraction Radiography of Industrial Materials.

GREATER NEW YORK—Jan. 5. 8:00 P.M. Hotel New Yorker. Frank Curtis, Van Norman Machine Tool Co., will speak on Principles of Tool Design Which Aid Economical Production.

MILWAUKEE—Jan. 8. Dinner. The speaker will be H. A. Frommelt of the Kearney & Trecker Corporation who will talk on "Plastics in Defense". The lecture includes the tools used in the manufacture of plastics and slides and a sound movie will be shown.

PEORIA—Jan. 6. 6:30 P.M. Creve Coeur Club, Peoria. Mr. Lincoln Mehlohope of Cincinnati Grinders will speak on Centerless Grinding. Reservations: E. W. Bowton, 412 Thrush Ave.

PHILADELPHIA—Jan. 15. 6:15 P. M. Engineers Club Philadelphia. Frank W. Curtis, A.S.T.E. President and with the Van Norman Machine Tool Co., will speak on the subject of Tool Engineering. The meeting is designated as "Our National President's Night".

PITTSBURGH—Jan. 9. Dinner 6:30 P.M. McCann's Restaurant. E. H. Alexander will speak about the "Use of the Photo Electric Cell on Machine Tools."

ROCHESTER—Jan. 14. Dinner 6:30 Meeting 7:45 P.M. River Campus, University of Rochester. This is a joint Meeting with A.S.M. W. H. Wills, metallurgist of the Allegheny Ludlum Steel Co., will speak on the subject of Molybdenum High Speed Steels. Reservations: C. G. Newton, Stone 2893.

ROCKFORD—Jan. 8. Dinner 6:30 P.M. 11th Fl., Hotel Faust, Rockford. Mr. Lincoln Mehlohope of Cincinnati Grinders will speak on Centerless Grinding.

ST. LOUIS—Jan. 8. Dinner 6:30 P.M. Melbourne Hotel, St. Louis. Speaker and subject to be announced.

SCHENECTADY—Jan. 8. Dinner 6:30 P.M. Danish Hall, Schenectady. Mr. H. J. Beattie will speak on the sub-

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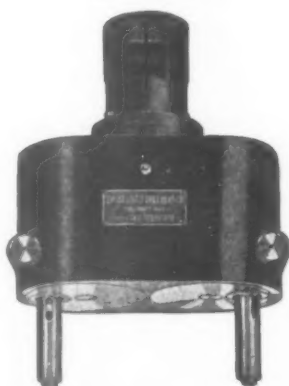
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WORCESTER—Jan. 12. Dinner 6:30 P.M. Putnam and Thurston's Restaurant, Worcester. Mr. Otto Winter will speak on the subject of Emergency Education.

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Handy Andy Says (Continued from page 120)

good tool design and which are particularly applicable to the small shops now engaged on defense work but which lack the highly specialized equipment of many of the large plants. In all, the talk was inspirational, impressing one with the soundness of old and tried ideas as it gave one an insight into future trends. But that, gentlemen, is evolutionary progress, that we rear the visions of tomorrow on the known bases of the present. And now, let our watchword be **V!**

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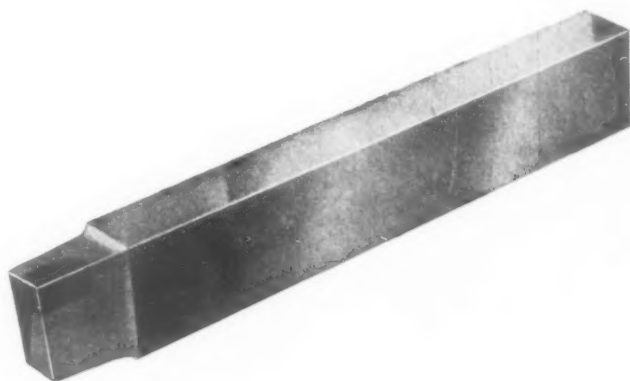
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Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	$\frac{1}{4} \times \frac{1}{4} \times 2$
R-101	L-102	$\frac{5}{16} \times \frac{5}{16} \times 2\frac{1}{4}$
R-103	L-104	$\frac{3}{8} \times \frac{3}{8} \times 2\frac{1}{2}$
R-105	L-106	$\frac{7}{16} \times \frac{7}{16} \times 3$
R-107	L-108	$\frac{1}{2} \times \frac{1}{2} \times 3\frac{1}{2}$

Right—200 Series

Tool No. Shank Size

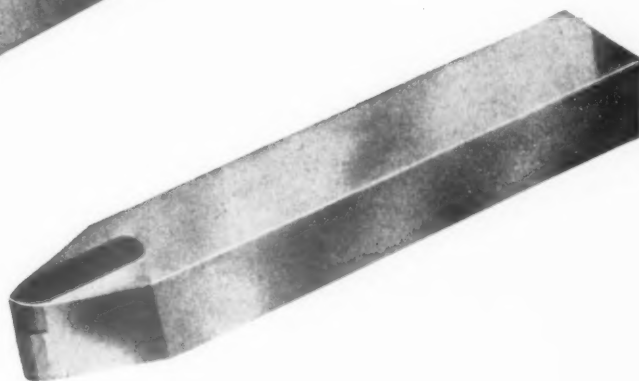
200	$\frac{1}{4} \times \frac{1}{4} \times 2$
201	$\frac{5}{16} \times \frac{5}{16} \times 2\frac{1}{4}$
202	$\frac{3}{8} \times \frac{3}{8} \times 2\frac{1}{2}$
203	$\frac{7}{16} \times \frac{7}{16} \times 3$
204	$\frac{1}{2} \times \frac{1}{2} \times 3\frac{1}{2}$



Below—300 Series

Tool No. Shank Size

300	$\frac{1}{4} \times \frac{1}{4} \times 2$
301	$\frac{5}{16} \times \frac{5}{16} \times 2\frac{1}{4}$
302	$\frac{3}{8} \times \frac{3}{8} \times 2\frac{1}{2}$
303	$\frac{1}{2} \times \frac{1}{2} \times 3\frac{1}{2}$



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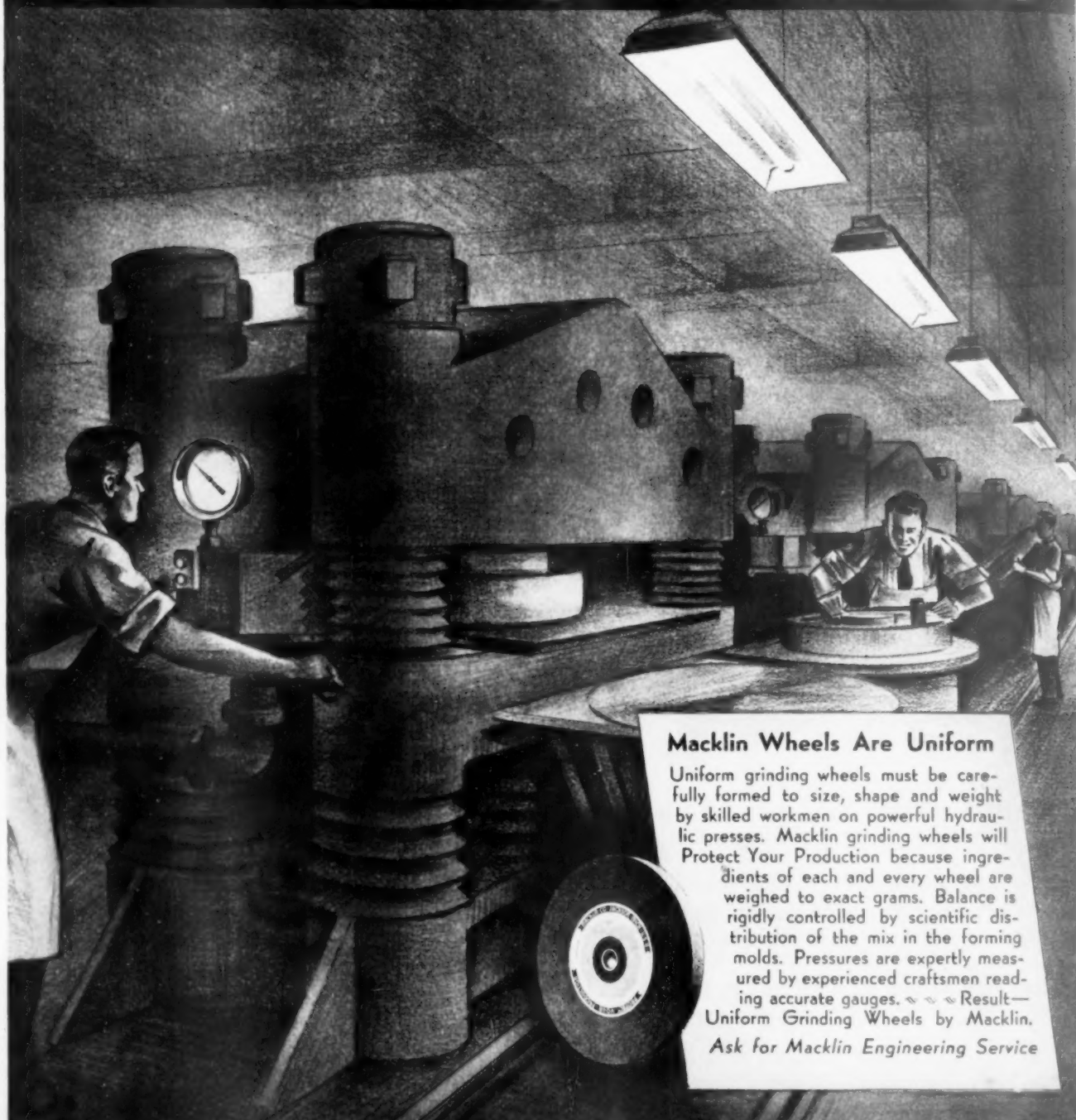
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